IN THIS ISSUE: Electrical Development of Western Oil Fields

JOURNAL OF ELECTRICITY

Entered as second class matter Jan. 1, 1917, at the post office at San Francisco, under the Act of Congress, March 3, 1879. Published on the 1st and 15th of each month. Subscription rates in U. S., $2.50 per year.

Vol. 46, No. 1 SAN FRANCISCO, JANUARY 1, 1921 Per Copy, 25 Cents

Century Motors for Every Western Industrial Need
They Keep-A-Running
CENTURY ELECTRIC COMPANY
ST. LOUIS, MO.
Sales Offices in Principal Cities

Forty-six Oil Pumps in the Pacific Ocean at Summerland, Cal., each producing an average of two barrels per day, are being operated by one 25 hp. Century Automatic Start Polyphase Motor, developing 24 hp. as a constant load. The wells are 500 ft. from land and measure up to 350 ft. in depth. The motor is shown on the right.

LIBRARY FEB 29

Fourteen Points OF SAFETY AND SUPERIORITY

1

Absolute Safety—Operating handle folding over fuse door serves as a simple, yet positive safety interlock.

2

Live contacts not accessible when fuse door is open.

3

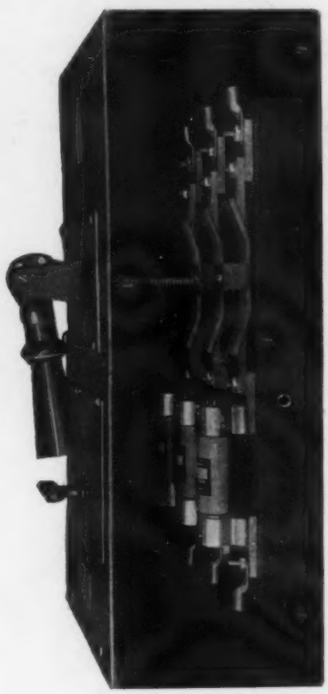
For testing purposes operating handle removable, giving access to live fuses by authorized persons. An interlock is of no value which prevents testing.

4

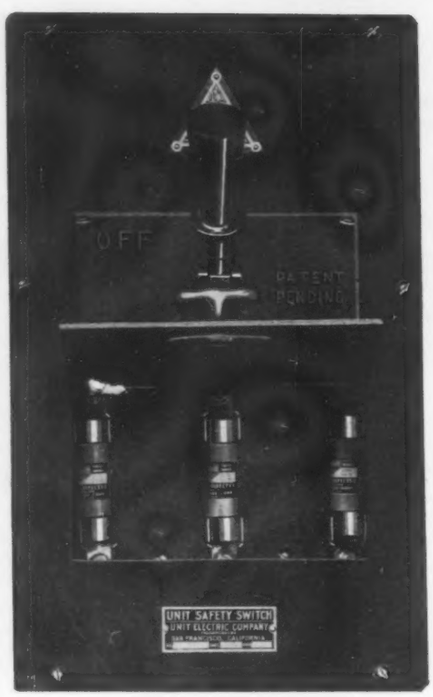
Laminated wiping contacts with wedge-shaped solid blades insures always positive contact.

5

Simple cam movement insures positive action. Switch cannot be left in partial contact or in any intermediate position between full "ON" and full "OFF."



UNIT
SAFETY SWITCH



6

Two simultaneous quick breaks in each pole reduces arcing and increases life of switch.

7

The complete mechanical Switch Unit is removable from the front of cover, for inspection or maintenance.

8

Switch adapts itself to surface or flush mounting, also for convenient grouping.

9

Switch can be locked in either "ON" or "OFF."

10

Switch cabinet shallow and roomy,—very accessible. Reduces installation cost.

11

Knockouts on sides, ends and back of switch.

12

Base is Asbestos Transite, has greater dielectric strength than slate.

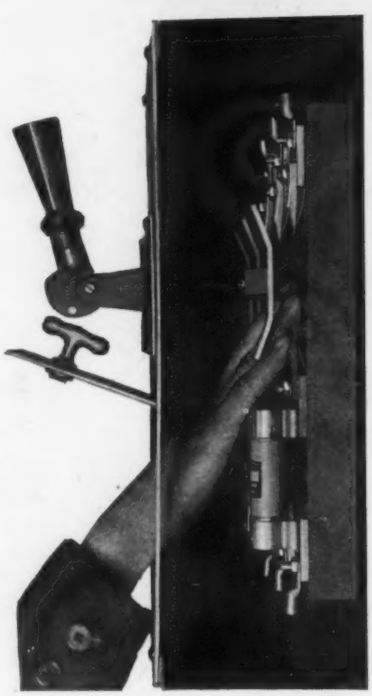
13

Switch mechanism very simple,—only two moving parts.

14

Costs no more.

—



Manufactured by

UNIT ELECTRIC COMPANY

450- 460 Natoma St., San Francisco, Cal.

PACIFIC COAST DISTRIBUTERS

BAKER-JOSLYN COMPANY

Los Angeles *San Francisco* *Seattle*

JAN -7 1921

JOURNAL OF ELECTRICITY

FOUNDED 1887

ROBERT SIBLEY, Editor H. W. L. GARDINER, Business Manager

VOLUME 46 SAN FRANCISCO, JANUARY 1, 1921 NUMBER 1

Contents

EDITORIALS 3

The Vision for Reconstruction—The Value of the Economic Drive—The Growth of Vancouver Island, Vancouver, B. C.—What of Shipbuilding?—A Formula for Reservoir Evaporation—The Rosy Dawn for the Electrical Industry—A Code of Ethics; What Is Needed—The Municipal Ownership Movement—Results From the Newest Cooperative Movements—Franchises and Service—Applying the Self Interest Story—The California Railroad Commission—Encouraging Factory Development in Oakland, Cal.—Weather Bureau Records for Western Needs.

PREPARING FOR FOREIGN TRADE — by W. C. Heston 8

Portland's million bushel grain elevator and cargo piers, equipment necessitated by the rapid enlargement of her ocean commerce, are well described in this article.

ELECTRIC POWER IN THE OIL FIELDS — by W. G. Lane 10

The manifold advantages of electric over steam operation in the drilling and pumping of oil wells are here discussed in comprehensive detail.

THE SHIPBUILDING OUTLOOK — by George A. Armes 17

A survey of the status of the shipbuilding industry on the Pacific Coast at the present time, and a comparison with world shipbuilding conditions.

APPLYING THE SELF INTEREST STORY 19

Work which has been performed, and plans for future efforts in support of the power companies and their financing of new hydroelectric development.

FIGURING EVAPORATION FROM TEMPERATURE RECORDS — by C. E. Grunsky 23

An interesting and reliable presentation of evaporation data, showing the effect of temperature upon stored water as contrasted with wind and humidity of the air.

HOW ONE CENTRAL STATION PUT OVER A PUBLICITY CAMPAIGN — by A. E. Wishon 26

The author not only makes plain to his readers the importance of a carefully worked-out plan of newspaper advertising, but also proves the importance of the apparently little things in gaining the public eye and ear.

UTILIZING SURPLUS POWER 27

With the yearly depletion of the coal deposits and the constantly increasing cost of fuel oil any economies in the use of power, such as those described in this article, are of primary importance to industry.

THE POSSIBILITIES OF A CONVENIENCE OUTLET CAMPAIGN — by Garnett Young 33

A discussion of the convenience outlet idea from the manufacturer's viewpoint, and how its continued promotion by the California Cooperative Campaign reacts to the benefit of the entire electrical industry.

Constructive Conservation—Frontispiece 2
Itinerant Electrical Exhibit for China 9
The Proper Spelling of Pit River 18
Problem Course in Electricity—by H. H. Bliss 29
Pamphlets and Clippings in a Business Library — by Virginia Fairfax 31
Sparks 35
Personals 37
Meeting Notices for Electrical Men 39
Happenings in the Industry 41
Latest in Everything Electrical 46
Books and Bulletins 47
New Electrical Developments 48
Vacuum Cleaner 50

PUBLISHED SEMI-MONTHLY BY

*McGRAW-HILL COMPANY of CALIFORNIA, Rialto Building, San Francisco

JAMES H. McGRAW, Chairman Bd. of Directors
ROBERT SIBLEY, President
H. A. LEWIS, Vice-President
H. W. L. GARDINER, Vice-Pres. and Bus. Mgr.

EASTERN OFFICES:
NEW YORK, Tenth Ave. at 36th St.
WASHINGTON, D. C., 610-611 Colorado Bldg.
CHICAGO, 1570 Old Colony Building
PHILADELPHIA, Real Estate Trust Building
ST. LOUIS, 713 Star Building
CLEVELAND, Leader-News Building

The McGraw-Hill Company, Inc., of New York, parent company to McGraw-Hill Company of California, are also

Publishers of

American Machinist, Electric Railway Journal, Engineering and Mining Journal, Power, Coal Age, Chemical and Metallurgical Engineering, Engineering News-Record, Ingenieria Internacional,

and of

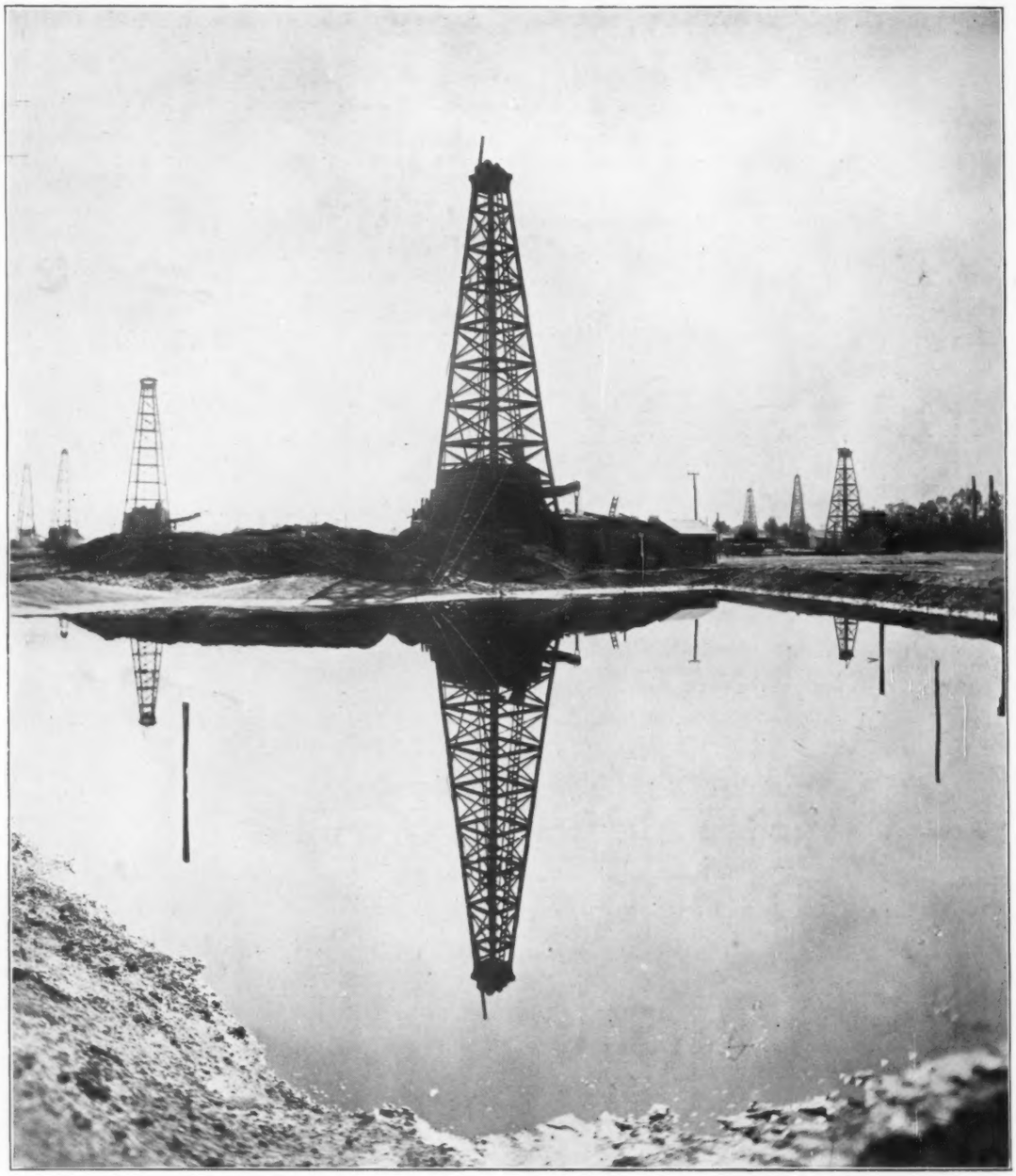
THE ELECTRICAL TRIO:

ELECTRICAL WORLD —— JOURNAL OF ELECTRICITY —— ELECTRICAL MERCHANDISING

Copyright, 1920, by The Technical Publishing Company. Subscription Rates in United States, Mexico, Cuba, Porto Rico, Hawaii and Philippines, $2.50 per year. Canada, $3.25 Gold. Elsewhere, $4 Gold. Single copy, 25c. When change of address is required, both old and new addresses must be given. Notice must be received two weeks before change takes place.

Member Audit Bureau of Circulation

*Change of name from The Technical Publishing Company to McGraw-Hill Company of California is now before the Cal. Com. of Corp. for approval.



CONSTRUCTIVE CONSERVATION IN THE WEST

EVEN the energy-laden oil now produced in California to the extent of over one hundred million barrels annually, cannot lift itself most efficiently by means of its own inherent energy. It must rely on the method electrical for economical pumping from its native reservoirs far below the surface of the earth. One power company of California now furnishes current to nearly three thousand wells. The average well uses approximately 100 kw-hr. daily, and yet if this well were operated with an individual steam plant, the average daily use of oil for the operation of such a plant would be in excess of two barrels per well operated. Practically all the energy used in operating these wells is hydroelectric, and consequently full two barrels of oil per well are conserved, or, estimated at 2500 wells operated, there is a conservation of 5,000 barrels per day or 1,825,000 barrels per year. Not only this, but the method in itself is an economic saving. Two barrels of oil deliver at the switchboard something like 250 kw-hr. of energy in our best steam power plants; or 500 kw-hr. under the steam method are necessary to accomplish what 100 kw-hr. do under the hydroelectric method of supply. Here, then, is a striking instance of how constructive conservation is progressing on an imposing scale in the empire of the West through the method electrical.

JAN -7 1921
©CLB486407

JOURNAL OF ELECTRICITY

DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 46 SAN FRANCISCO, JANUARY 1, 1921 Number 1

(Copyright, 1921, by McGraw-Hill Co.)

The Vision for Reconstruction

¶ ONCE AGAIN it is the West that in the hour of need is to give to the world the driving vision to carry our people safely through the reconstructive era now upon us—an era beset with falling prices and a strong undercurrent of fear throughout the nation in so far as commercial and industrial activity is concerned.

¶ HERBERT HOOVER, the much beloved and able engineer statesman of the West, has been called to the head of the Federated American Engineering Societies, a group of powerful engineering organizations now joined in mass formation for public service.

¶ IN ACCEPTING the new position of power and honor, Mr. Hoover states that our nation has just passed through a period of unparalleled speculation, extravagance and waste, and as a consequence we shall now not only reap its inevitable harvest of unemployment and readjustment, but shall feel the real effect of four years of world destruction, while economic and social problems will stand out in sharp relief.

¶ MR. HOOVER sees in the growth of great employes' associations, great farmers' associations, great merchants' associations, great bankers' associations and great labor associations, tremendous powers for world activity in readjustment—powers not to be feared, but powers which may, when properly coordinated and correlated, furnish the means whereby individualism may be preserved and the happiness of our people brought to higher levels of attainment.

¶ HERE IS a new thought for every citizen of our great West. The electrical industry of the West has through such institutions as the California Electrical Cooperative Campaign already demonstrated to the world how conflicting interests and conflicting organizations can be welded into correlated units that may immeasurably forward the common good. Mr. Hoover proposes such cooperation in a vastly broader sense, and it would seem that once again the West is to supply the vision that will reconstruct a distorted industrial and commercial world.

The Value of the Economic Drive

There is much in the picture one may paint of the advantages of electricity, its usefulness and its service. Often times this picture will sell an appliance or bring about the installation of new electrical devices. Yet after all, the economic saving thus accomplished must be the final determining factor in bringing about electrical innovations. One forceful instance of economic advantage in the method electrical is often better than a thousand words in bringing out this point. Take the pumping of oil in the great oil fields of California: it is not difficult to explain to a man how clean and convenient the electric drive is, to show him that it is superior in all its features to the steam drive or the gas engine drive; but when it becomes known that 100 kilowatt-hours of electrical energy can accomplish in the pumping of oil the same thing as has been accomplished by two and one-half barrels of fuel oil under steam generation, representing an energy outlay of 500 kilowatt-hours, this conservation of 80 per cent in the oil fields silences at once every opposition. And so, in the selling of the electric range, the electric washing machine, the idea of the electrification of the steam railroad and a thousand other possible uses of electricity that lie before the industry for the next decade, we must not forget the fact that when once the economic gain can be computed in dollars and cents and forcefully presented, all arguments are directly overcome. Hence each salesman of a power company and every appliance salesman or apparatus handler may well remember the overwhelming arguments of the economic drive. When the customer is once sold on the self-interest appeal, there is won over to the method electrical a lasting convert.

I HEREBY RESOLVE

(a) to shoot at a high bogey

(b) not to shoot the woman who sends for the trouble man when she has failed to turn the switch—poison is more effective

JANUARY 1, 1921

THE GROWTH OF VANCOUVER ISLAND, VANCOUVER, B. C.

As an example of the industrial progress which is being reported from all parts of the western region, the power sales department of the B. C. Electric Railway Company, Ltd., records an increase of 500% in the load contracted for during the five months from December, 1919, to April, 1920, over the same period in 1918-1919. During this period 110 new power accounts were opened and 220 motors connected, aggregating 3,280 hp. added during the five months of the previous year. Industrial Island, a section of reclaimed land in the center of the city which is served by both land and water transportation, has played an important part in this growth. This has been a development of the last few years, but already the island represents an imposing array of factories of all types, each of them dependent upon electricity for motive power.

What of Shipbuilding?

There seems to be a general impression current that ship building is a dead issue in the West, an impression much favored by newspaper accounts of graft and extensive talk of yards closed down, of strikes and of receiverships. It is true that one or two of the most well-known names are no longer represented among active shipyards and that the depression in Oriental trade from which we are just emerging has somewhat discouraged trans-Pacific shipping, but there are nevertheless several aspects of greater optimism which are worth considering.

It has been proposed to overcome the disadvantages of the Pacific Coast in the freight charges which must be paid on marine machinery, by building the hulls alone on this coast and sending them through the Panama Canal for outfitting in the East, a practice which has already been followed in some instances. In spite of such disadvantages as here implied, however, it is nevertheless a fact that the Pacific Coast is enjoying an activity in the ship building line felt in no other part of the country. In British Columbia, government orders and a new line of steamers to Australia planned by one of the railway companies are keeping the shipyards in full activity with orders ahead for some time. Portland reports many ships under way, with good prospects ahead. In California, San Francisco bay shipyards report orders on hand for a two-year period with extensive work on ship repairs, and there is a similar prosperity reported by the yards of the south. Seattle alone has practically retired from the shipbuilding field, a situation due in part to the choice made by the shipyards at the close of the war in accepting payment for all work under way as far as it had progressed, rather than continuing as before in the hope of further advances in the shipping field, as was done in other districts.

The ultimate future of the shipyards of the Pacific Coast is of course dependent upon future developments in shipping, but it is by no means a discouraging outlook, as analyzed by a prominent shipping man in an important article in this issue. No promises are being made, but on the other hand, with the growth of trade and passenger activity across the Pacific which the next decade undoubtedly holds, there is every prospect for a steadily increasing demand for ships. Pacific Coast builders are not enlarging their yards at the present time, but they are holding themselves in readiness for greater prosperity ahead.

A Formula For Reservoir Evaporation

The subject of evaporation from reservoirs is one of special importance to the power industry of the West, where the storage of water is such a vital element in hydroelectric development. Where the utilization of six feet of water storage is allowed in a natural reservoir, such as a lake, it is not out of the way to find that from three to four feet of water may be lost through evaporation, an item which is obviously not only important, but essential to calculate before any development is undertaken. And yet there is perhaps no other subject of equal importance concerning which engineers are willing to confess themselves so ignorant. So many factors, from wind velocity to humidity and temperature, affect the rate of evaporation to some degree, that no means has yet been found of prophesying evaporation with exactness.

On another page of this issue is presented a working formula and curve for such calculations which has been evolved by C. E. Grunsky, the well-known consulting engineer of San Francisco, from observations upon California streams. Mr. Grunsky has presented evidence to show that the controlling factor in all open water evaporation is the temperature of the air and that for estimating yearly evaporation averages, it is safe to ignore the factor of wind entirely. He has derived a formula from observation figures which give probable sea level evaporation at all temperatures, correction being made for altitude where this is involved. The curve of this equation when plotted conforms with reasonable

accuracy to evaporation curves from records taken in different parts of the world. The formula makes no pretense of exactness, but nevertheless offers a means of prophesying results at any given reservoir site within reasonable limits of accuracy, and may be regarded as an important contribution to the discussion of the problem.

The Rosy Dawn for the Electrical Industry

Simply because the market for automobiles, alarm clocks, and sugar has dropped off and the factories have shut down in the face of canceled orders, some of the electrical fraternity think they face the same cold gray dawn with the beginning of this year. Whereas some of the other industries have been living a wild life for the past few years with rising prices and filing cabinets full of unfilled orders, the electrical industry has been enjoying the calm sweet sleep o' nights and the domestic joys of a steady business man. With the awakening at the first of this year, there are some who are going to face a cold gray dawn with calls for plenty of ice water for over-inflated and fevered heads—but for the electrical industry comes the call to wake up, get on their toes and enjoy the rosy dawn.

Twelve million homes need wiring, one hundred and fifty thousand industrials need to be electrified, and there are millions of new homes to be built which will be clamoring for fixtures, convenience outlets and electrical labor savers.

Nothing has ever come to the fellow who sat tilted back in his swivel chair and sniffled over hard times. We all know that; but do we all realize that the best way to get business is to get out and sell? It seems not; but the need is there for the electrical industry, the demand is there and the money is there. Here in the West we have faced two hard years of power shortage and the power companies have not whined but have dug into the game to try and forestall another power shortage. And they have succeeded. They have built new plants and this year they are going to brush the dust off of a lot of contracts they had on the shelves and sign on the dotted line. That means business all around the circuit and with cooperation, faith in each other and getting out and doing some real selling, the electrical industry should make 1921 a record year. You have to go and get it—but it's there.

A Code of Ethics—What Is Needed

The recent annual gathering of the American Society of Mechanical Engineers has brought out a very interesting situation. The committee on a code of ethics reported its finding which represents the result of eighteen months of consistent effort and work. After the report had been thoroughly discussed it was sent again to the committee to report again at a future date, with a view to presenting a general code, such as would be applicable to all branches of the engineering profession. This action is especially interesting in view of the fact that one of the well known engineering publications, Engineering News-Record, under date of Dec. 2, came out forcibly editorially with the opinion that such a thing was unthinkable. The fact remains, however, that fundamental principles of ethics are as old and of as general application as the Ten Commandments themselves, and unquestionably it will prove true that broad general principles of ethics can be drawn up so that all engineers may readily accept them, and so that the interpretation of the code of ethics may well be left with the individual engineering societies themselves. In the case of the American Society of Mechanical Engineers it is proposed not only that an interpretation be given, but also that power to recommend or expel members for disobedience to the code be delegated to the governing council of the society. The entire subject of a code of ethics is one of great interest throughout the nation, and particularly in the West where similar discussions have been prevalent during recent months, especially in the electrical industry. The outcome of the movement proposed by the American Society of Mechanical Engineers will be watched with great interest.

The Municipal Ownership Movement

The League of California Municipalities at a recent convention passed a resolution asking the state of California to take over the power companies and develop the hydroelectric resources of the state. The San Joaquin branch of this organization has gone one step further and made plans "to secure power sites for the development of hydroelectric energy for the municipalities in the San Joaquin valley."

Journal of Electricity has never taken a stand for or against municipal ownership but is interested in the development of the hydroelectric resources of the West and the application of that power, in the manner that will bring the best service to all of the people of the West. If the state of California could take over the power companies of that state—and they have a valuation of some $600,000,000—and could proceed with the necessary development, which is estimated at $500,000,000 for the next ten years, and proceed with that development more rapidly and more efficiently than the power companies, the Journal of Electricity would endorse the movement as being the best thing for the industry in that state.

We believe that the future of the West depends on the rapid development of its resources and with the present power companies, we believe that they are the agents best qualified to carry out the program of construction. Any interference with their plans, any stumbling blocks put in their way, any diversion which may cause them to turn even for a moment from their task, is like a monkey wrench thrown into the cogs of progress of the West.

I HEREBY RESOLVE

(a) to do business at a profit
(b) not to do my fellow workers

JANUARY 1, 1921

HOME ECONOMICS
Isn't this just what your Wife wants for Christmas
"WHY I Will Appreciate Electrical Gifts MOST"
Read the Telegram's Electrical Page
Capital Electric Co.
electrical goods from ELECTRICAL DEALERS

RESULTS FROM THE NEWEST CO-OPERATIVE MOVEMENTS

The Northwest Electric Service League and the Rocky Mountain Electrical Cooperative League, the latest of the cooperative movements in the West, are already showing results in joint advertising for the Christmas merchandising season. The electrical pages here shown from the Salt Lake Telegram and the Oregon Daily Journal of Portland are the forerunners of regular electrical pages which have been undertaken by the electrical groups of these cities. An interesting contest has been inaugurated by the newspaper in question in Salt Lake City, for which prizes are to be merchandise orders which can be used at the store of any member of the Cooperative League. The space given up to various electrical items of news value is also especially to be noted on the Salt Lake page. A special feature of the Portland advertising, which is the joint work of the contractor-dealers of that city, is the generous support of the power company expressed in the introductory statement. This is the broadest type of cooperation and is certain to bring good results.

Franchises and Service

The fact that a city franchise is usually a revenue producer for the city is generally recognized, but its effect is usually not really understood by either the power company man or the taxpayer. The usual franchise is granted to a power company giving it the right to run underground cables and overhead wires, and in return for this privilege the power company turns over to the city from two to five per cent of its gross revenue from that city. The average taxpayer congratulates the city on its low tax rate and then continues each month to pay an indirect tax to the power company which in turn hands it over to the city. It would be interesting to find out the real tax rates of certain cities if all the indirect taxes could be traced.

The more constructive view of a franchise which should be taken by the cities is, that it is a privilege extended in return for a service rendered. The extension of water and gas mains and electrical distribution lines into a new part of the city increases the value of the property there, and automatically, the tax rate. It hardly seems fair that the companies responsible for this increased value should be forced to pay the increased taxes. The land owners who benefit from these extensions should assume the slight increase in taxes, rather than distribute this expense among all the consumers of the companies. This would mean a reduction in operating expenses and a consequent reduction in rates and in this day of agitation over rising rates the power companies might do well to give some publicity to the factors which enter into operating expenses besides actual labor and materials. The man on the street only knows of the power houses, transmission and distribution lines and has no realization or understanding of the many other costs, such as franchises, overhead expenses and replacement funds which enter into the final cost of the current delivered at the consumer's meter. There is an opportunity for some good educational work along these lines which should be considered by the power companies.

Applying the Self Interest Story

Accepting the axiom that the "central station development is the thermometer that indicates the degree of prosperity of the entire electrical industry" as true, the San Francisco Electrical Development League has started a campaign to sell central station securities to all of the members of the industry in the vicinity of the bay cities. This application of the self-interest story is perhaps the best indication that the entire electrical industry have gotten the grasp of the story and that they have determined to show the public that they have the utmost confidence in the industry which they represent.

On another page of this issue is an account of the campaign now being waged by the San Francisco Electrical Development League. It is printed with the idea that the electrical industry in other sections of the West may evolve a similar working scheme, and not only assure the power companies that it is behind their program one hundred per cent, but bring its members to realize that the prosperity of the West, and of their own businesses, depends upon the prosperity and development of the power companies. It is not enough that the power companies be endorsed in their work of development, but they must have good, sound, substantial financial support. It is a chance for cooperation of the highest degree, an application of the self-interest story to yourself and a chance to prove to the man in the street and yourself that you have faith in yourself, your business and your industry, and that you are willing to back up that faith.

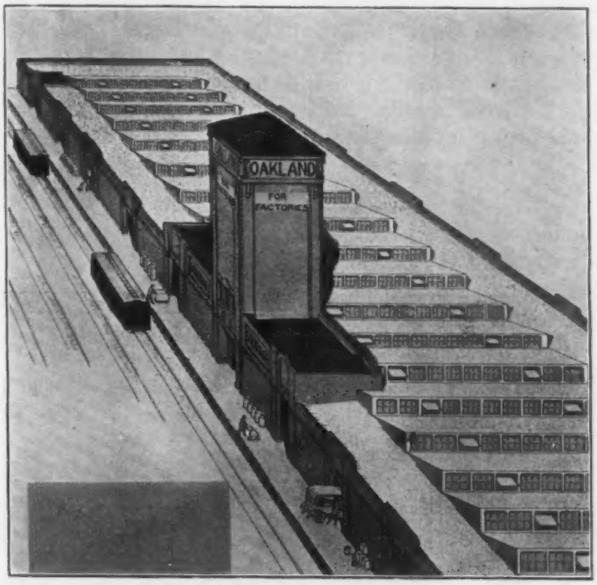
The California Railroad Commission

There are two Railroad Commissions in the United States whose work stands out above all others, whose decisions are quoted by courts and by other commissions and the opinions of whose leaders are sought upon questions of state and national importance. These are the Railroad Commissions of Wisconsin and California.

The California Railroad Commission from its beginning has been under the leadership of able men. John Eshleman impressed his own fine sense of justice upon that body in its first few years—and the high standard of impartial equity has been maintained through the administrations of both Max Thelen and E. O. Edgerton. The power commissions of California have had no special privileges under these commissions, they have gained no undue advantages—indeed, at times they have had to listen to arraignments of themselves which were not easy to take; but they have in the main been certain of essential justice. The California Commission has taken the consistent stand that the public utility

must render adequate service to the public at a reasonable rate, but that in payment for this service it is entitled to a reasonable return on its investment—a return less than that expected in other businesses, to be sure, but one sufficient to make public utility securities a desirable commodity in the minds of possible investors. Commissioner Edgerton, addressing a group of men of the power industry in 1919 could say, "All the advertising in the world, all the explanations you may make, all the excuses you may put forward, will count for nothing if you are not prepared with conviction in your own soul, to go to the people with the proposition that their welfare comes first." This is the standard set for the power industry—and it is to the credit of the power men who were present that they cheered the speaker.

The terms of two of these California Commissioners expire with the first of the year. In this connection there has recently been some agitation started by groups holding the conviction that no rate decision is a fair one unless it lowers rates, with the obvious intention of discrediting the present commission and thus securing the appointment of men who will agree with their views. No greater misfortune could befall California. In the interest of the continued development of the West along all lines of agricultural and industrial growth, it is of the utmost importance that the high calibre of this commission be maintained.



ENCOURAGING FACTORY DEVELOPMENT IN OAKLAND, CAL.

The friendly attitude of the business community, together with convenience in shipping facilities and the availability of cheap and reliable power, are the important factors in attracting factory enterprise to a community. Such a policy of welcome is reflected in the "factory incubator" which is planned by the Chamber of Commerce of Oakland to encourage the development of industries in the Oakland district. This is to take the form of a large, well-planned factory building located at Emeryville, which will be rented out to developing industries not large enough as yet to undertake a building of their own. Conveniences and modern equipment can thus be provided for all at an expense to each one very much smaller than would be possible with an individual installation. Complete electric wiring for both light and power is included in the building plans.

Weather Bureau Records for Western Needs

Uniformity in methods of keeping records is an excellent thing, but like most excellent things, it can be overdone. The only point in keeping records at all is to provide information of value for later use, and if conditions to be recorded are not uniform an over-standardization of methods will sometimes rob the information of its entire value.

Weather bureau records prescribed by the department in Washington are a classical example of such stupidity. It seems that temperature records are taken in Washington early in the morning in order to establish minimum temperatures for the day—and in order that such records may be uniform, all local bureaus throughout the country are directed to take observations at the same time. This sounds logical—but it is further directed by headquarters that this shall be understood to mean the same time by Washington clocks, so that on the Pacific Coast, where the sun runs on a three-hour later schedule, this morning record of temperatures is taken some time along about the middle of the night!

This is a minor matter, resulting in annoyance mainly to the local offices, and it would perhaps not be worth recording were it not for the fact that the same oversight of Western needs is reflected in rulings affecting various other weather bureau records of more general importance. Western rainfall divides the year roughly into two seasons, winter and summer, practically all rainfall occurring between the months of October and May. In order, then, to gain any idea of successive seasons, it is necessary to have total figures covering these winter months. But Eastern conditions are quite otherwise and because it has been found convenient to divide the year with the calendar in that region, it has been ruled that Western rainfall reports refer to years from January to January. A dry winter may thus be entirely obscured by the excessive rain which fell during the preceding spring—or, vice versa, an especially wet season may not appear in the records at all, being averaged with the two seasons on either side of it.

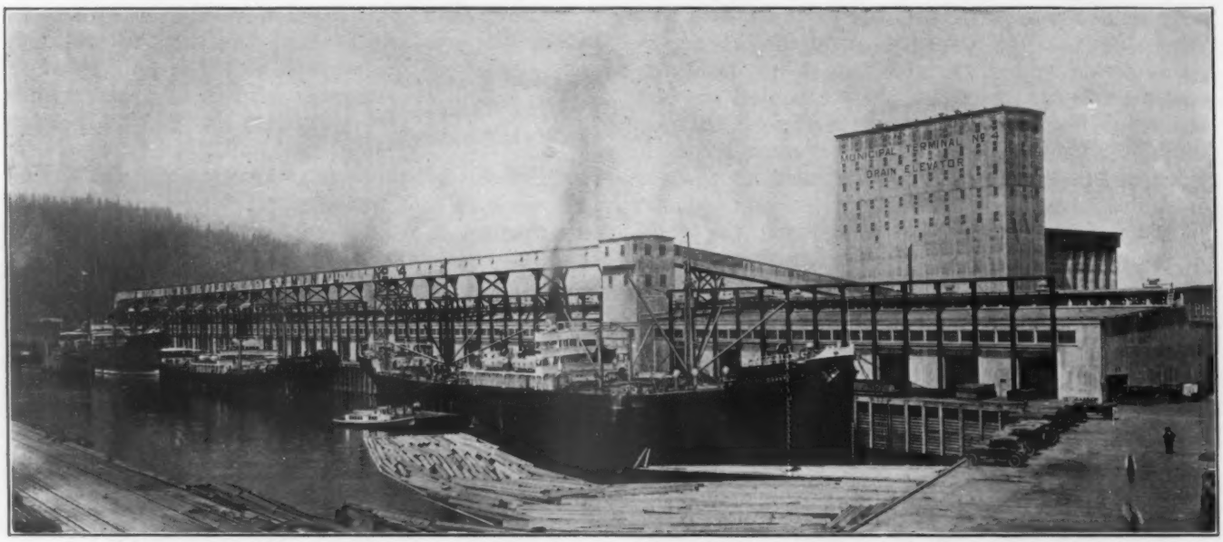
In sectional reports, the Western bureaus have sought to remedy this neglect, but these are published only at intervals of several years. Rainfall records are of particular importance to Western engineering, where the precipitation of a few months must be depended upon for power and irrigation needs for the entire year—and an effort should be made to break through the government red tape which admires pretty figures in uniform columns, and secure a sensible division of the year for practical use under Western conditions.

I HEREBY RESOLVE

(a) to spend a few minutes every day keeping up with my technical magazines

(b) not to spend more than seven-eighths of my time at convention golfing

JANUARY 1, 1921



Municipal Terminal No. 4, Portland, Oregon, showing the grain elevator and storage bins and pier No. 1. The ultimate development of the site calls for the erection of four more cargo piers similar to the one shown here. There are a number of very attractive industrial sites on the Terminal property, where the advantages of rail and water transportation may be had.

Preparing for Foreign Trade

BY W. C. HESTON

(Completion of permanent improvements at the mouth of the Columbia River, and the fact that fifty per cent of its export trade is made up of locally manufactured goods, are the facts given by the author to explain the sudden growth of Portland's foreign commerce since the signing of the armistice. The author is industrial engineer with the Portland Railway, Light & Power Company.—The Editor.)

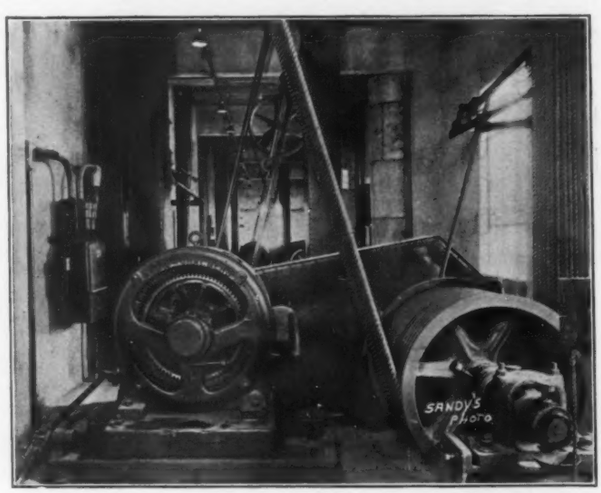
Just as the West has led in engineering achievement, so has Portland set the pace for the Pacific Coast in modern and up-to-date facilities for handling its ocean commerce. The million-bushel grain elevator and cargo piers, known as Municipal Terminal No. 4, built under the direction of the Commission of Public Docks and the Port of Portland, represent the last word in equipment for the handling of bulk grain and general cargo, and the application of electricity to port operations.

Growth of Commerce

Completion of permanent improvements at the mouth of the Columbia river a year before the war has given a controlling depth of 42 feet at mean low water with a clear channel 4600 feet wide. The Port of Portland has cooperated with the federal government in channel improvement and with a minimum depth of 30 feet, and width of 300 feet or more at all points, Portland has the most rapidly growing foreign commerce of any port of the Pacific Coast. The fortunes of war deprived Portland of practically all its off-shore shipping, because the ships in service were needed by the government. Its revival has therefore been the more remarkable by reason of the magnitude so quickly attained. Its export trade is made up of about 50 per cent locally manufactured goods, which after all, is a true index of prosperity and permanence of a port, since conversion of raw material into the finished product is what creates circulation of the pay roll dollar. Portland is the largest lumber manufacturing city in the world and the center of the lumber industry of the United States; it is the largest flour shipping port of the coast, and has been running close to New York in export movement of wheat. It is therefore a natural sequence that the most modern ideas should be embodied in its elevator and dock facilities for handling cereals, the annual production of which is steadily increasing in this territory.

How the Grain Is Handled

The first unit in the immense development has just been completed and is now handling this year's grain crop. The route of the grain through the



A motor installation typical of the neatness and workmanlike manner of installing all equipment at the terminal. This is a 75-hp. motor driving a shipping leg in the grain elevator, by means of silent chain and rope drive.

elevator is as follows: Grain is received in cars either in bulk or sacked and is dumped into one of 12 receiving bins. From the receiving bins it is placed on transfer belts and conveyed to the base of the elevator legs, which raise it to the top floor of

It is no trick for this little electric giant to lift a bale of burlap weighing half a ton and place it on a dolly for transportation to the ship. The tractor shown draws 10 or 12 of these trailers at one time, at a speed of 15 miles per hour.

the elevator. From this it descends by gravity to the scale bins, which have a capacity of a car of grain each, where it is weighed. From the weighing bins by means of a transfer belt the grain may take any one of three routes, viz.: it may be placed on conveyor belts by means of spouts, and taken to the storage bins for permanent storage; it may be turned into shipping bins for temporary storage before shipping; or it may be placed in the shipping legs which deposit it on two rubber conveyor belts, 1200 feet long and 30 inches wide, driven at a speed of 600 feet a minute by two 100-hp. motors, and transferred to two similar conveyors running the full length of the cargo pier. From these it is either loaded directly onto the ship or sent to the resacking bins where it is resacked and shipped as sacked grain.

In order to prevent any possibility of mixing consignments of grain, an elaborate annunciator signal system, to supplement the telephone and speaking tube system, has been worked out by E. F. Dunlap, electrical engineer of the terminal, to show the scale man exactly which of the 12 receiving bins the grain is coming from, thus preventing any possibility of mistake.

There are 47 motors in the elevator, aggregating 900 hp., all of which are 440-volt, three-phase, 60-cycle, squirrel cage motors. Power is supplied by the Portland Railway Light & Power Company, at 11,000 volts, and stepped down to 440 volts for distribution to the motors.

On the pier are to be found the latest electrical devices for facilitating the handling of cargo. These include electrically operated stackers, conveyors, ramps, electric trucks, electric tractors, and an electric automotive crane. The crane is used for lifting heavy cargo from the floor and placing it on small four-wheeled trucks, or for any other heavy lifting work. The tractors may be seen scurrying the length of the 1000-foot pier with a string of loaded trailers a hundred feet long.

Adequate facilities have been provided for handling bulk molasses and vegetable oils, and pier 5 is being rushed to completion for the handling of several hundred thousand tons of phosphate rock.

Portland's progress as a port has all been made since the signing of the armistice, and it now finds itself entering the constructive cycle. At first there was difficulty in finding cargoes for the ships and ships for the cargoes, but a balanced condition has now been reached and commerce is growing in a very substantial and satisfactory way.

ITINERANT ELECTRICAL EXHIBIT FOR CHINA

A houseboat containing practically all the latest electrical labor saving devices which are to be found in American homes will make a tour of the canals and rivers of China this winter. It will be used to bring home to the Oriental estate owners the possibilities of supplying their own power, light and heat by using the same type of farm light plants which have been so universally adopted in the rural districts of the United States during the past few years.

The boat, which is now being rigged out by the Western Electric Company at Shanghai, is scheduled to make a trip of about 5,000 miles. Its wares will be shown in a territory populated by more than a hundred million Chinese, most of whom are absolute strangers to anything electrical. It will carry a complete line of household devices, including motor-driven sewing machines, vacuum cleaners, irons, washing machines and the labor saving electrical apparatus which American farmers are now using. A staff of expert demonstrators will make the trip and show how easily electricity may be introduced locally by means of the farm light plants, despite the absence of electric power companies in China's farming districts. With the introduction of local lighting plants one of China's greatest handicaps in the way of study and development will be relieved. It is realized that only the wealthier classes will be able to purchase the electrical apparatus, but the great number of retainers on their estates should profit indirectly. It is expected that the foreign missionaries, also, will seize the opportunity to obtain the electrical comforts they had used in their birthplaces. Occidental manufacturers in the interior of China are adopting the farm plants to furnish power to the homes of their local representatives.

I HEREBY RESOLVE

(a) to tell the Self Interest story
(b) not to tell where I got it

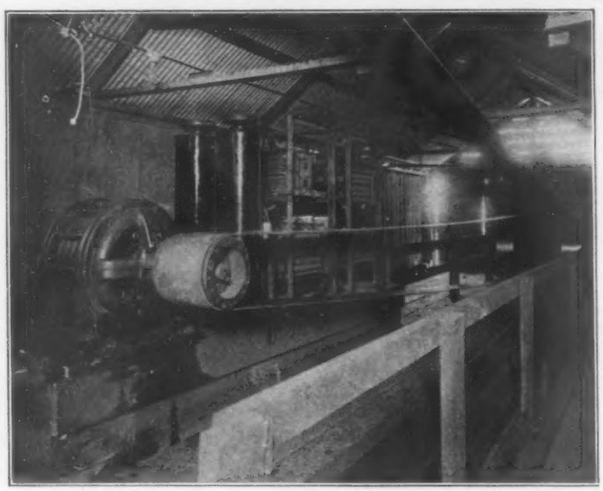
JANUARY 1, 1921

Electric Power in the Oil Fields

BY W. G. LANE

(Constructive conservation is being preached by all the economists as a remedy for the present financial conditions, and the shortage of oil has led to the adoption of the most economical methods in the oil fields. One of the best examples of constructive conservation is the adoption of electrical pumping in the oil fields, which saves at least two barrels of oil per day, as the electricity used is mostly hydroelectric energy. One company serving 2500 wells figures the saving at over 1,825,000 barrels of oil per year. This comprehensive article covering the uses of electric power in the oil fields is written by the sales agent of the General Electric Company of Los Angeles.—The Editor.)

Under the present conditions of scarcity and high cost of skilled labor, "cost of production" becomes a question of the utmost importance to all employers of labor. There is perhaps no field of industry where the substitution of electricity for all



75-hp. oil well drilling motor equipment operating standard cable tools in Los Angeles county

other forms of prime movers has so favorably affected the cost of operation as in the production of crude oil. It is the purpose of this article to deal with this application particularly with reference to the oil fields of California, although the claims in favor of electric drive enumerated herein apply with equal force to any other fields, due allowance being made for whatever difference may exist in prevailing power rates.

It may, perhaps, be of interest to note that the first known application of electricity to the production of crude oil was in the Baku Fields of Russia during the year 1900, when several wells were pumped by motors. So far as the writer can determine, the first electrification in the United States was made in 1906 by the South Penn Oil Company in their fields at Folsom, West Virginia. There are at the present time approximately ten thousand pumping wells in California, of which approximately twenty-eight hundred are electrically operated, either individually on the beam, or in groups from power jacks.

Oil companies have in general reached a very receptive mood toward electric drive for oil field operations, and its very rapid adoption has been due not only to the fact that after several years of experimental development motors have been produced which meet every requirement, but also because a large percentage of the electric energy consumed is generated by water power, with a corresponding low rate to the consumer. Inasmuch as the apparatus now offered the consumer has been thoroughly tried and approved by the operators themselves as being far superior to their time-honored and supposedly indispensable steam engine, it is not necessary to discuss herein the various problems confronted and overcome in its development, but rather to explain the present apparatus and its application.

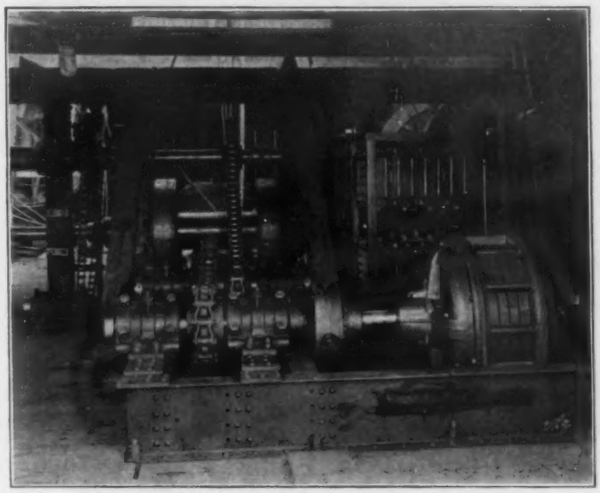
The program of developing a producing well is divided into two parts, that of drilling the hole, and that of pumping the oil therefrom.

Motors for Drilling

A special equipment to handle all of the necessary operations of drilling by either the standard cable tool or rotary process has been developed by the General Electric Company. The standardized equipment consists of a 75-horsepower variable speed induction motor; a main controller and resistor for providing ten possible speed variations between half and full load speed; an auxiliary controller and resistor for dividing each of the ten speeds furnished by the main controller into eight additional speeds; an oil circuit breaker for protection against undervoltage or overload; and a speed reducing countershaft provided with the proper size pulleys to give the correct drilling speed. If the installation of this equipment for use with standard cable tools no change is necessary in the construction of the rig except in the size and arrangement of the engine house, the speed reducing countershaft occupying the usual engine block, the motor being installed on an additional engine block situated on the band wheel side of the countershaft, the mechanical arrangement and usual scheme of installation being as illustrated.

The motor itself consists of a variable speed slip ring type with polar wound rotor. The main and auxiliary resistors and their governing controllers are connected in series with each other and with the motor rotor, this scheme permitting each of the steps on the main controller to be subdivided into small increments, the total possible speeds being a product of the control points on the two controllers, thus providing great flexibility. The controllers are provided with rope wheels, and are operated independently by telegraph cords from the headache post. It is recommended that all the control and protective apparatus be mounted on a separate engine block as a complete unit in itself in order to facilitate its removal to a new location upon the completion of a well.

In standard cable tool drilling, the matter of utmost importance to the operator is that the tools shall have free drop in order to strike the most cutting blow. In order to accomplish this, the motor must slow down perceptibly on the lifting stroke,



100-hp. oil well drilling equipment operating shaft drive rotary for La Merced Oil Company, Montebello Field, Los Angeles county

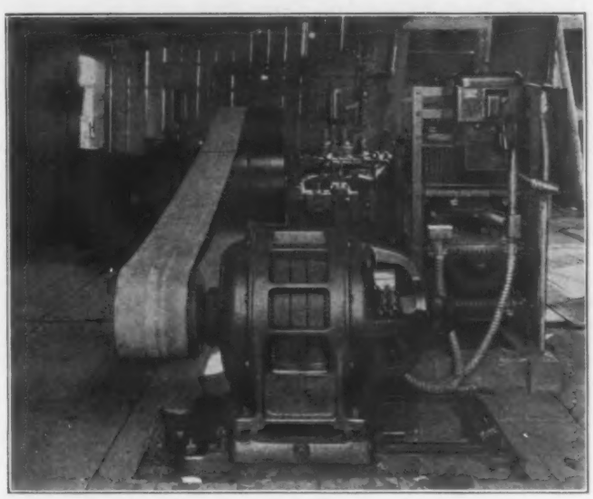
and speed up on the falling stroke. This result is very satisfactorily obtained by so proportioning the countershaft pulleys that some of the main resistance is always left in the rotor circuit when operating at the correct drilling speed, and by the very fine speed adjustment obtainable through the introduction of the auxiliary resistance, to make the beam accord with the natural period of vibration of the drilling line. The auxiliary resistance is designed only for the purpose of obtaining micrometer adjustments when actually drilling on the beam, and must be shorted out by means of the auxiliary controller during all other operations such as pulling the tools, bailing, fishing, etc. This is for the reason that the power required for actual drilling on the beam is only a small percentage of the normal rating of the motor, and if left in circuit during operations requiring either the normal or overload capacity of the motor, it would be subjected to such severe overloads as to cause great liability of its burning out.

This micrometer speed adjustment is necessary because the beam has a critical speed at which the tools will strike the most effective blow. Too slow a stroke means too little work accomplished for the time consumed, while too fast a stroke merely takes the stretch out of the wire without permitting the tools to strike a cutting blow.

In territory where a caving formation is encountered, making necessary the use of a circulating or slush pump, or in cases where the operator prefers to obviate the necessity of frequent bailing by handling the cuttings with a mud pump, belt driven mud hogs are installed as a separate unit, and are driven by a single variable speed motor of from 35 to 50 horsepower, the capacity of the motor depending on the nature of the formation encountered, and whether or not it is to be used for cementing.

For drilling by the rotary method, the same electrical equipment is required, but with a slightly different set up. Experience has demonstrated that if the operator will proportion his sprockets so that the rotary table cannot exceed a speed of 80 r.p.m., which compares favorably with that ordinarily used with steam drive, a 75-hp. standard cable tool drilling motor will satisfactorily handle the work. However, the tendency has been to make use of the tremendous overload capacity of electric drive with a resultant speeding up of the rotary table to about 100 r.p.m. with a consequent increase in hoisting speed. Working on the theory that "it is better to be safe than to be sorry," most of the operators have standardized on 100-hp. slow speed motors for driving the draw works and rotary table, the slight difference in initial cost being more than offset by the assurance that they have ample power to meet whatever conditions they may encounter.

In standard cable tool drilling, even under conditions of frequent reversals, the fact that both the countershaft and band wheel are belt driven, and preferably through long belt centers, provides a cushion for the motor bearings against severe shock occasioned by such reversals. Therefore a standard two bearing motor is satisfactory for this application. On a rotary rig, however, reversals are much more sudden and frequent, and occur while the motor is operating at higher speed and delivering greater horsepower. Furthermore, when the bit strikes a boulder or other formation which it can neither pene-



Installation of duplicate motor driven mud pumps for La Merced Oil Company, Montebello Field, Los Angeles county

trate nor dislodge, and starts putting a twist in the drill stem, an instant reversal is necessary to save the drill stem from being twisted off. Because of this severe duty imposed, belt drive on a rotary rig is not satisfactory and chain and sprockets are em-

I HEREBY RESOLVE

(a) to accept conditions and make the most of them
(b) not to accept a mandate for Ireland

JANUARY 1, 1921

ployed for both the drive from the motor to speed reducing countershaft, and from this countershaft to the draw works spindle. These chains being positive drive, provide no cushion from severe shock, and it is therefore necessary to use either a three bearing motor or some modification of it in order to protect the motor bearings.

The ideal drive from the motor to the speed-reducing countershaft is through the medium of a high speed silent chain operating on short chain centers, but to insure satisfactory operation some means of maintaining perfect alignment of the two shafts must be provided. From the countershaft to the draw works spindle, standard 1240 rotary chain is employed.

The latest development in electric rotary set up is that of the La Merced Oil Company operating in the Montebello Field at Los Angeles. On this particular rig 1240 rotary chain was used for both drives, but should the operator later decide to use silent chain drive, no change would be necessary except substitution of the proper sprockets and chain. Duplicate mud pumps are used on this rig to provide a greater factor of safety, the mud pump motor being provided with a special base to permit of movement along its shaft in order to shift the belt from one pump to the other as shut-downs for valve renewals and re-packing may require. In this installation, as in all rotary rigs, a 50-hp. variable speed motor drives the pumps.

Cost of Installation and Operation of Drilling Equipments —

On the basis of present prices a standard cable tool equipment including the motor, controllers, oil circuit breaker, countershaft and countershaft pulleys can be installed complete, ready to run, but exclusive of all belts, buildings or foundations, for approximately $3,200.00. If a circulating pump is to be used necessitating the installation of a 50-hp. variable speed motor, this figure will be increased to approximately $5,100.00. Since all rotary rigs require the circulating pump motor, the latter figure will cover a 75-hp. rotary installation. If a 100-hp. motor is used on the draw works and rotary table, the installation complete with mud pump motor will approximate $5,400.00. These figures are for the electrical equipment only.

So far as cost of operating drilling equipments is concerned, this varies according to the nature of the equipment, the character of the territory, the depth of the well, and the prevailing rates of the power companies furnishing the service. Naturally as the hole goes down the cost increases, since it takes longer to bail, longer and heavier strings of casing must be handled, and the weight on the beam constantly increases. The following extracts from letters received from various companies operating both in the southern and northern California fields tell the story of electric drilling equipment from the standpoint of the operator more eloquently than any amount of argument could possibly hope to do.

Mr. E. W. Klein, secretary of the San Fernando Gas & Oil Company of Los Angeles, operating near Newhall, Los Angeles county, says:

"Our operating expense to date has not exceeded $200.00 per month for power and lights, running full capacity 24 hours daily. We consider electric power the best and most economical, as well as the cleanest of any power for oil drilling. The well was drilled to 1800 feet."

Mr. F. L. Van Epps, of the Beatty Oil & Development Company of Los Angeles, operating on their lease at Eagle Rock, Los Angeles county, says:

"I have been very careful in watching the operation of the motor and in observing how the drillers liked it. * * * Our motor operates the tools beautifully. We can get almost any speed desired and the tools drop as freely as with steam. We can pull the tools or bailer faster with the motor, and we at all times have "steam up," and have no delays with waiting for the tooley to get up steam, clean the flues, or any of the dozen delays that go with the average steam plant, and if some one burns out a boiler, it is no bother to us. * * * As to the cost of operating our motor, in January we drilled 22 days and used juice for 5 days more, and the total power bill was $93.70, or about $3.34 per day. In February for 29 days our bill was $92.03, or about $3.17 per day. I am confident that the electric equipment on this lease shows a saving of 75 per cent over the cost of operating a steam plant, and at least 15 per cent in the efficiency of the men, as they are where they are needed, on the derrick floor."

Mr. Albert Miller, of the Active Oil Company of Los Angeles, operating at Sylmar Station, near San Fernando, Los Angeles county, writes:

"Our total monthly power bills (including light bills) for the drilling of our well from the beginning of operation are as follows:

December 12th to January 12th,	6340 kw-hr.	$141.40
January 12th to February 12th,	6880 kw-hr.	146.80
February 12th to March 12th,	7480 kw-hr.	152.80

"On March 13th the hole was 565 feet deep, but a considerable quantity of power was employed, not in making the hole, but in dealing with conditions caused by heaving sands."

Mr. W. Nelson Shell, president of the San Fernando Oil Company, operating in Pacoima, near San Fernando, Los Angeles county, writes:

"Our power and lighting bills since installation of your system have been as follows:

Period	Light	Power
Oct. 2 to Oct. 11, 1919	$ 1.04	$ 27.60
Oct. 11 to Nov. 12, 1919	42.79	184.36
Nov. 12 to Dec. 13, 1919	43.76	287.18
Dec. 13 to Jan. 13, 1920	37.46	163.24
Jan. 13 to Feb. 13, 1920	29.21	182.16

"We estimate that the use of fuel oil for the work we are doing, including transportation to our lease, would run about eight to nine hundred dollars per month, indicating, as you will see, quite a material saving."

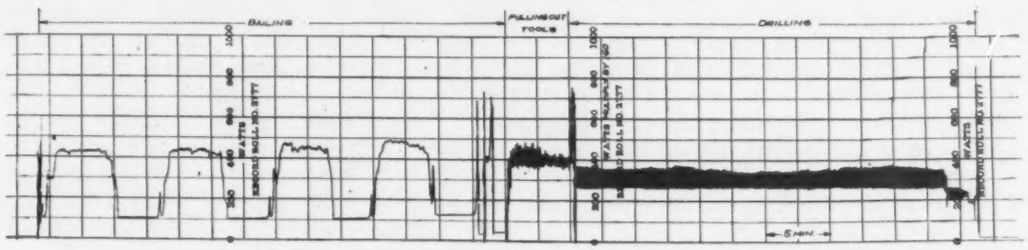
An old established company in Ventura county, which is at present operating eight standard cable tool rigs with mud pumps and agitators, furnished the following data on a well recently drilled, the particular well not having included a mud pump in its equipment.

Period	5/1-7/26	7/26-8/26	8/26 -9/25	9/25-10/31
Cost of Power	$132.85	$163.50	$201.25	$202.20
Depth	1096	1407	1952	2129
Period	11/1-11/26	11/26-12/27	12/27-1/27	Well brought in
Cost of Power	$212.15	$217.88	$94.20	
Depth	2274	2581	2987	

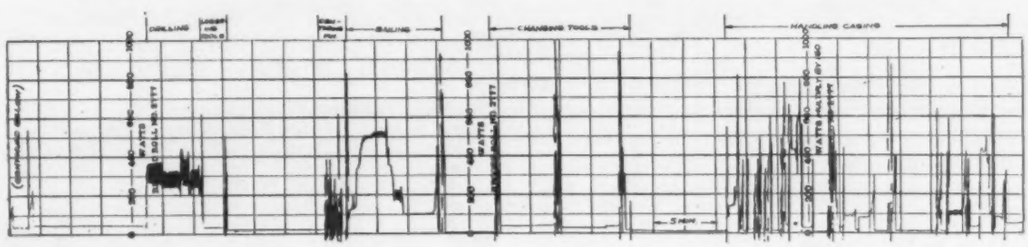
The above figures cover standard 75-hp. cable tool equipment operating without mud pump or agitator motors, but inclusive of lights, forge blowers, etc. The Shell Company of California are operating four equipments consisting of a standard 75-hp. cable tool drilling motor, with a 40-hp. mud pump motor, and the power company furnishing service supplied the following information.

"On well 'A' the total bills rendered for the twelve months of 1919 amounted to $3,936.44, an average of $328.00 per month. On the Turnbull Canyon well, the total bills rendered for the four and one-half months which this well has been drilling, amount to $1,221.24, an average of $271.00 per month."

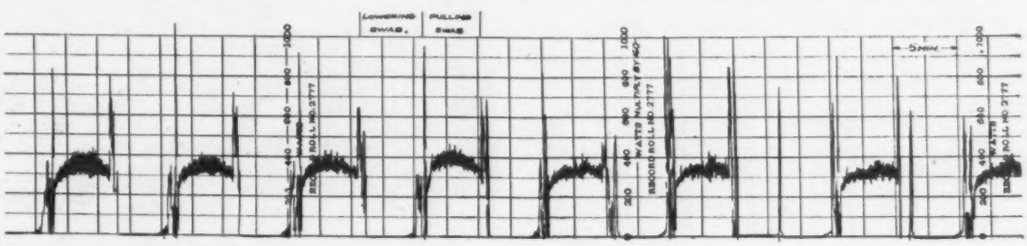
The former well has just been completed and put on the beam at a depth of 4,580 feet, and is the deepest well ever drilled electrically in the United States.



Wattmeter record of drilling with standard tools and bailing in a 10-inch casing at a depth of 2025 feet



Wattmeter record of miscellaneous work in connection with drilling a 10-inch hole with standard tools at a depth of 1840 feet.



Wattmeter record of swabbing a 4½-inch casing at a depth of 2165 feet

The Western Union Oil Company drilled the Smiley No. 1 well at Whittier, Los Angeles county, to a depth of 2520 feet with a standard rotary equipment consisting of a 100-hp. drilling motor and 50-hp. mud pump motor, in a total elapsed time of 45 days, of which 16 were required for actual drilling, at a total cost for power and lights of $325.00.

On all of the above wells the power was furnished by the Southern California Edison Company, and the rate prevailing at the time the figures were furnished was on a basis of $1.00 per connected horsepower per month standby charge, with an additional energy charge of 1 cent per kw-hr. for all power consumed, plus a surcharge of 1 mill per kw-hr.

The Western Union Oil Company on the Harris lease near Orcutt, California, drilled a well with a rotary equipment using a standard 75-hp. drilling motor and a 40-hp. mud pump motor at a total cost for the period of five weeks, from November 11 to December 17, 1919, inclusive, of $306.60, or an average of $245.00 per month. In this time a total depth of 1,850 feet was reached. This well was finished with standard cable tools to a depth of 4300 feet, at an average power cost per day for the entire period of drilling operations of $8.44, inclusive of lights. Other wells were being drilled near by with steam equipment, and the average fuel consumption was 40 barrels per day, the cost of fuel oil at that time being $1.50 per barrel delivered at the well, making the charge for fuel oil alone average $60.00 per day, to which must be added the cost of boiler feed water.

Power for the last mentioned well was furnished by the San Joaquin Light & Power Company, and the prevailing rate at the time above information was furnished was 1½c. per kw-hr. for the first 12,000 kw-hr. and 1¼c. for all over this amount.

Load Factor, Power Factor, and Character of Load —

The actual operation of drilling on the beam is a fairly steady load, but the load imposed by other operations, such as handling casing, running the bailer, fishing, etc., is intermittent in character and requires very high torque and frequent reversal. For this reason the motor must be able to deliver

I HEREBY RESOLVE

(a) to use courtesy toward the public
(b) not to use raisins in bread—it is such a waste of the raisins

JANUARY 1, 1921

power far in excess of its normal rating, since such ability often means the freeing of a string of frozen casing, a frozen bailer, or the dislodging of frozen tools in a fishing job. The normal average drilling load runs about 30 hp., although other operations enumerated above sometimes require a momentary maximum demand as high as 200 hp. As a consequence both the load and power factor of the circuit are lower than on the average industrial load, but it must be borne in mind that unless oil property is developed, the very desirable pumping load cannot later be taken on. Numerous actual meter readings, taken not only over a considerable period of time but also on a number of different drilling rigs in various fields, show the average energy consumption per twenty-four hour day to be as follows:

1000	foot	territory	150 to 170 kw-hr.
1500	"	"	180 to 215
2000	"	"	200 to 235
2500	"	"	230 to 270
3000	"	"	250 to 285
Over 3000	"	"	265 to 350

Comparison of these figures with the specific examples listed above for the different depths will show that these averages are a very reliable criterion for figuring drilling costs, they being on the basis of a standard cable tool equipment without mud pump motor.

Advantages of Electric Drilling —

Briefly summarized, the advantages of electric over steam operation for drilling are as follows:

Cheaper initial cost.
Cheaper operating cost and less depreciation.
No standby losses when equipment is idle.
None of the delays occasioned by the operation of steam boilers.
Equipment is capable of developing several times its rated power.
Explosions are eliminated and fire risk reduced.
Motor cannot run away should the wire line break, or a belt run off.
Considerable saving in time, due not only to faster operation but also because of elimination of delays incident to steam operation.

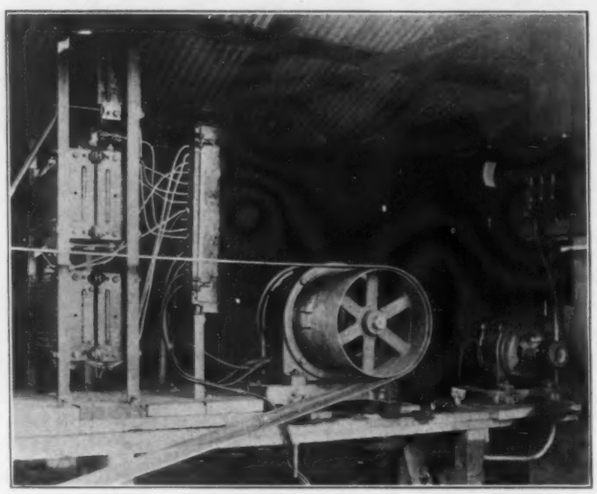
Motor Equipments for Oil Well Pumping

So many factors affect the amount of power required to pump a well, that the most careful calculations will not check with the results of actual tests. A large amount of sand will considerably increase the power required, while the presence of gas will act as a lifting agent and considerably decrease the power input. Furthermore, proper counterbalancing to offset the weight of the rods operates to effect a considerable saving in power. Other conditions being equal, the power required to pump a well will depend on the length of stroke, the number of strokes per minute and the size of tubing.

Motors for pumping, pulling and cleaning, although of the same general type as those employed for drilling, are of considerably smaller horsepower. Wells can be pumped electrically by any one of three methods: on a power jack; by a small motor suitable for pumping duty only; or by a special motor designed to take care of all of the necessary operations around a pumping well.

In shallow territories where the wells are small producers, where pulling and cleaning has to be done very infrequently, and where the location of the different wells makes such a method practicable, a number of wells can be operated from a central power head or jack at a comparatively low cost per well. A standard constant speed squirrel cage induction motor is suitable for practically all conditions. The motor is belted to a countershaft, which is in turn belted to the power head through a quarter turn belt. The power required for pumping wells by this method depends upon how well they are balanced against each other.

Wells on the beam which have settled down so that a given constant speed of pumping is satisfactory, but which by reason of their production cannot be satisfactorily operated from a power jack, can be individually operated by small horsepower, squirrel cage induction motors. Should it be advisable to vary the speed of the well from time to time, a single variable speed motor can be employed instead of a constant speed squirrel cage motor. In either of the last two mentioned applications, some external



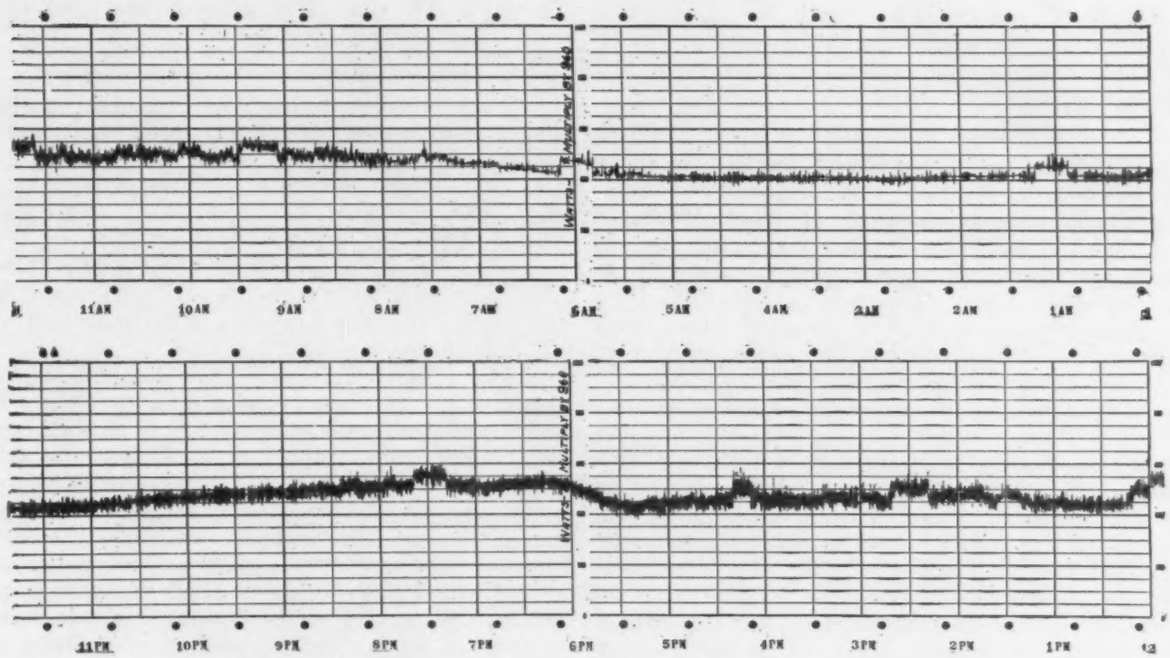
Installation showing one arrangement for individual pumping on the beam with a small horsepower squirrel cage motor with a larger portable slip ring motor for pulling and cleaning.

means must be employed for shaking up, pulling or cleaning.

Regardless of the size of the motor, an equipment consists of the motor with its base and pulley, a controller operated by a telegraph cord from the headache post, a speed regulating resistor, and an oil circuit breaker for protection against undervoltage and excessive overload. A speed reducing countershaft is also necessary, and in instances where the motor equipment is to replace a worn-out steam or gas engine, the crankshaft of the engine is often used as a countershaft, after replacing the heavy flywheels with proper size pulleys.

Cost of Installation and Operation of Pumping Equipment —

Although there are some wells which could be satisfactorily handled by the pumping motor rated 10/25 hp., the conservative tendency of the oil operators to overpower rather than take a chance has resulted in the 15/30 hp. equipment being accepted as the standard. It is only in cases of wells of ex-



24-hour load curve of substation serving a portion of the Coalinga oil field in California

ceptional depth, or very heavy gravity and oversize tubing that the motor rated 20/50 hp. has been used.

On the basis of present prices, a 15/30 hp. equipment can be installed complete, ready to run, inclusive of countershaft with proper size pulleys, but exclusive of belts, buildings or foundations, for approximately $2,000.00. The same installation using a 20/50 hp. equipment would cost approximately $2500.00.

Conditions in the California fields vary over such a wide range that it is impossible to determine an average pumping cost. Specific examples are of little value since the results obtained do not check against those of other fields whose pumping conditions are apparently similar. In many cases the power consumption of deep wells is no more than that of shallow ones. Generally speaking, wells individually pumped on the beam require from 60 to 150 kw-hr. per 24-hour day for all operations associated with pumping on the beam. The highest cost of which the writer has a record is a 3900-foot well tubed with 2½-in. tubing on the lease of the Birch Oil Company at Fullerton, Orange county, the power cost on which averages about $90.00 per month.

An average of twenty wells in the northern field over a period of three months operation, pumping at depths ranging from 1800 to 3000 feet, and handling oil with a specific gravity ranging from 11° to 21°, through 2½-in. and 3-in. tubing, at an average speed of 20 strokes per minute, shows an average monthly consumption per well of 4,130 kw-hr., or a daily average of 138 kw-hr.

An average of 366 wells in the Midway and Coalinga fields of California, pumping from depths ranging from 1000 to 2500 feet, showed an average monthly consumption of 2,600 kw-hr. per well, or a daily average of 87 kw-hr. Since power rates in the northern California fields will average around 1½c. per kw-hr., it is safe to assume that the average pumping cost per well is somewhere between $40.00 and $75.00 per month.

Load Factor, Power Factor, and Character of Load —

Oil well pumping comprises the largest percentage of an oil field load and is therefore the chief factor in determining its character. The fact that one motor must take care of a widely varied range of operations necessitated the design of a very versatile motor, and for this reason an oil field load generally has a power factor considerably lower than would be expected in ordinary industrial service. When a given territory has been developed to the point where correction of this low power factor becomes advisable, it is most economically taken care of by the installation of synchronous or condenser equipment in the primary circuit, the widely scattered nature of the load making correction of the distribution circuit prohibitive.

The accompanying illustration shows actual wattmeter readings taken in the field indicated, and shows the ideal nature of a pumping load, in that it is practically constant twenty-four hours a day, every day in the year, and without any seasonal variation. Although it is true that the maximum demand of a pumping equipment when used for

I HEREBY RESOLVE

(a) to improve my relations with the public
(b) not to try to improve my relations

JANUARY 1, 1921

pulling and cleaning operations is far in excess of that required while pumping on the beam, the diversity factor of a large number of installations prevents the peaks from being felt.

Advantages of Electric Pumping —

Electric drive practically eliminates most of the shut-downs chargeable to engines due to rod breakage; water clogged steam lines; trouble with the engine itself, etc. Rod breakage is greatly reduced since the motor during the pumping stroke does not pick up the rods with a jerk as is the case with steam or gas engines, the speed of the band wheel being practically constant during the entire revolution. The rods are therefore less liable to crystallize.

In pulling and cleaning a well, a motor will pull the first stand of tubing as fast as the last one, practically regardless of the load to be lifted, while with engines the speed is considerably reduced on the heavier work. Quicker work can be done with motors in spotting rods and tubing when screwing up, since no delay is caused by overtravel when hoisting and lowering. On the lease of the Birch Oil Company, near Fullerton, the cleaning gang using a standard 15/30 pumping and cleaning motor equipment, pulled sixty 60-ft. stands of ¾-in. rods in 55 minutes.

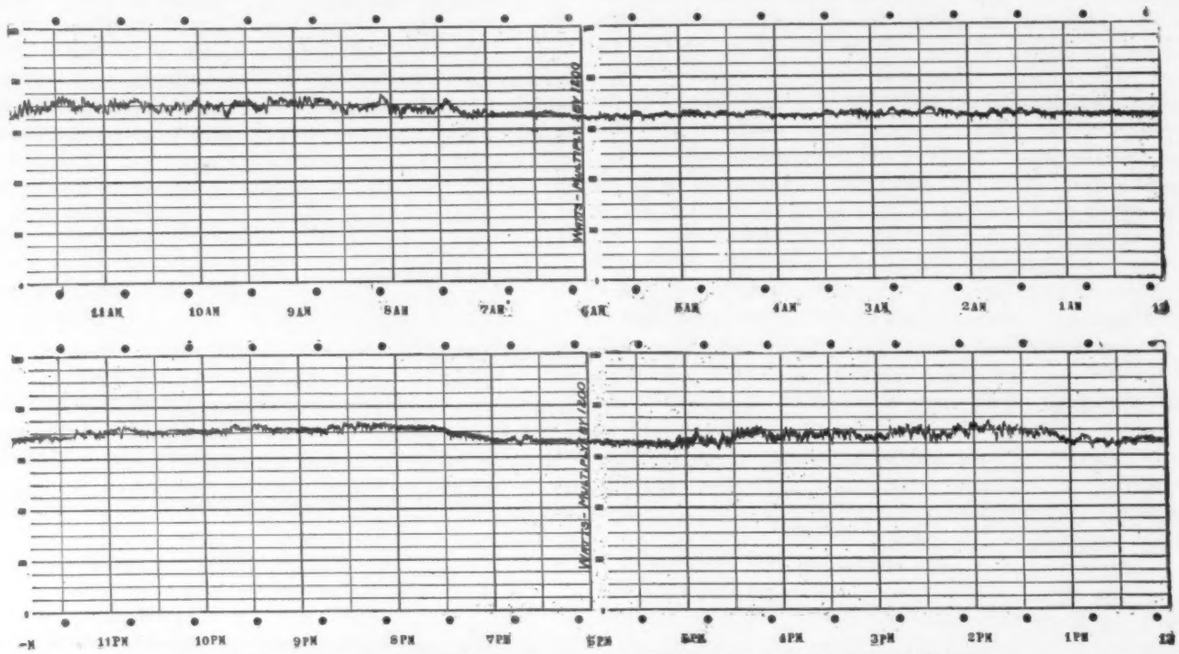
One of the most noticeable savings effected by the use of electric pumping equipment is in the item of labor or attendance charges. Because a motor can always be depended upon to pump the well at a given constant speed on the same point of the controller, thus obviating the possibility of speed fluctuations encountered with steam or gas engines, and because the motor is provided with protective devices to guard against possibility of damage in emergencies, one pumper can look after a greater number of wells, with the assurance that the possibility of the engine running away and its constant damage, due to parting of the rods or breaking of the band wheel belt, is absolutely eliminated.

Other Applications of Electric Power

Nearly all producing fields maintain machine shops, operate compressors for casing-head gasoline plants, gathering and line pumps, dehydrators, etc., and require considerable energy for lease lighting. Motors for the above uses are usually single speed and of either the squirrel cage or slip ring type, depending on the starting duty which is required. They operate at high efficiency and good power factor, and are not only a steady and desirable load, but also a high revenue producing load.

The Rancho La Brea Oil Company, of Los Angeles, are at present operating four motors for driving casing head compressors, the motors being of 175 and 200-hp. capacity. This plant was originally driven by gas engines, the gas used for fuel being that from which the gasoline had been removed, the cost of same being negligible. However, troubles incident to the best of gas engines caused shut-downs which averaged about four days per month, and calculations and experiment proved that the cost of repairs and the amount of gasoline lost during this shut-down, which could not later be recovered due to the gas having been sent to the mains, would pay for the power consumed by a motor of the required capacity. As a consequence one of the compressors was motor driven as an experiment, with the result as above indicated. Furthermore, the capacity of the compressors was considerably increased due to the more steady drive, and the labor and maintenance charge greatly reduced.

Electric dehydration has already proved its superiority to such an extent that any discussion of its merits is unnecessary herein. Although this item of load is not a large one, it is constant and steady, and therefore desirable.



24-hour load curve of substation serving a portion of the Midway oil field at Taft, California

Machine shop drive does not differ from the same application in ordinary industrial service. Motor operated line and gathering as well as loading pumps, require considerable power, operate almost continuously and provide a steady and constant load.

Future Possibilities of Oil Field Electrification

The ever increasing price of fuel oil, and the constantly increasing demand for natural gas for industrial uses in the cities, has resulted in the oil operator's attention being more and more directed towards electrification. Electricity has permitted the wildcatting of territory so inaccessible that it would have been left unexplored had it been necessary to depend upon the transportation of steam equipment and its subsequent expensive maintenance. During the past year there has been an unprecedented demand for electric energy for both pumping and drilling operations, which demand the power companies have been unable to satisfy, due partly to lack of rain during the past two years, and partly to insufficient developed resources. The problem at the present time is therefore not that of convincing the operator of the desirability of electrification of his properties, but rather that of the power companies developing sufficient generating capacity to be able not only to take care of the load offered, but to be in a position to assure the consumer that the supply will be unfailing.

The Shipbuilding Outlook

BY GEORGE A. ARMES

(Under the stimulus of war the shipbuilding industry became one of the most important and thriving industries on the Pacific Coast. The return to peace time conditions and their differing demands makes the following survey of the situation of especial interest. The author is president and general manager of the Moore Shipbuilding Company, California.—The Editor.)

Dependent as it is upon the progress and outcome of world reconstruction, the future of shipbuilding is a question to be answered only by a prophet of international events. A builder may note the direction of the wind and the trend of affairs at home and abroad and may shape his course accordingly, and yet he must realize that a sudden development in any one of a number of fields will bring new conditions and new problems.

Trade, buying power, rates of exchange and merchant marine are closely related. A blow at one travels the line and affects each. To say that Europe today is stricken is another way of saying that the great war is ended and that disturbed conditions of reconstruction obtain in all of its countries. It is exporting almost nothing, is handicapped by exchange rates, and is without buying power. There is little reason, then, to expect that capital will be put into ships, that the cart will be put before the horse, and that men without goods will concern themselves with carriers.

All these problems are of national concern in each of the countries across the Atlantic and the best minds and the strongest efforts are being given toward their solution. No one may say what is to come or how soon Europe is to recover. Prophecy is difficult if not impossible.

Types of Ship in Demand

A present condition for immediate consideration is the simple and outstanding one that the war is over and that there is a work of peace. It looks as if the next ten years will see but few freighters built, and that the shipbuilding of that time will be navy vessels, tankers and some combined cargo and passenger vessels.

With this in view an increasingly important part of the Moore shipyard's work must be that of repairing and overhauling. Neglect of needed repairs during the emergency, the unusual strains put upon bottoms, and the fact that many craft were hastened to completion can mean only that there is to be much of this labor of putting the merchant marine in shape. Equipment to meet this need, efficiency at the task and prompt work that means a minimum of time during which the vessels must be laid up, are requisites which will mean continued employment of men and uninterrupted operations. It is the needed work for today and one that will keep the Moore plant in readiness for the recovery that will come to Europe.

By the first of January the Moore shipyard will have turned out fifty-one large vessels, many of which are already famous in the annals of the sea, and have under construction and contract twelve more. Two 14,000-ton freighters for the Matson Navigation Company of San Francisco are under construction; four large tankers for the Standard Oil Company of California and New Jersey, two tankers for the Vacuum Oil Company of New York, and one for the Southern Pacific Company of New York are in the number. This is private business of peace time and conducted in peace-time conditions.

Extensive Repair Work

In a short space of time since September 20th, 1920, one hundred and fifty-three vessels have been taken from the estuary at the Moore shipyard, given their necessary repairs and sent about their business. These are figures that speak of present conditions and of the policy to put the plant in a position to do the work of reconstruction.

Cases in point are the Java Pacific liner "Arakan" which was pounded on the beach off Point Reyes, and the Matson Navigation Company's

I HEREBY RESOLVE

(a) to help finance power development in the West
(b) not to help finance state highways through automobile fines

JANUARY 1, 1921

steamer "Enterprise," both to be renovated and reconditioned from stem to stern. Each represents a considerable task in repairing and construction of the kind that the shipyards are to be called upon to perform, regardless of a world's market for bottoms.

It took six tugs and a salvage steamer to float the "Arakan" into deep water, after which she was towed to the shipyard, docked on a marine railway and surveyed. The bid for repairs was $297,854 with a 90-day time limit. A brief description of the extent of the job and how the problems were met may serve to emphasize the most important phases and obligations to be considered. Immediately the contract was awarded the repair crew was put to work. The ceiling on the tank tops was removed, tank top plates taken off and burners sent in to prepare for the removal of the bottom shell plates. Men began dismantling the engines, boilers, pumps, and so forth. In six days the vessel was floated and towed to the shear legs where the propelling machinery, pumps, electrical apparatus and boilers were removed. This work, which was started on September 23rd, continued until October 6th, when the hull was docked again on a marine railway and the intensive work was started. In thirty calendar days, including four Sundays and one holiday, this work which included the extensive hull repairs was concluded, and the "Arakan" was floated again and taken to the shear legs for boiler and machinery installation. On November 29th, eighteen days ahead of schedule time, the work was completed and the vessel on the seas when the contract date expired.

The "Enterprise" repairs are being made under a bid of $186,000. It will be seen that the two jobs represent a sum not far below a half-million and are but two out of the large number of similar ones, large and small, that are demanding attention.

There is, then, at present a great field in ship reconstruction, over and above the demand for new navy vessels, tankers, and the combined passenger and freight vessels. The Moore company will have built 24 ships from February 1, 1920, to February 1, 1921, and these are present day statistics. On account of the readjustment of industrial conditions and also the uncertain condition of the oil industry, it is difficult to prophesy the future demand.

Of the ability of the western shipyards to compete with eastern shipyards there is no question. We have the big factor of climate in our favor. It may be said that Europe is not producing nor purchasing. Shipowners who have recently placed orders for new tonnage are now trying to cancel them even at loss. Present costs will not allow a profit on investment, the stockholders are told, and unless there is a change many mills and shipyards will have to close down. Norway is sobering down from having had too much money, and financial conditions there are critical. In Germany the shipyards are ready but there is no material, and arrangements must be made with other countries for plates and other materials. Exports and imports there are showing a large increase. England and Scotland are suffering from high wages and high cost of living and labor conditions in which labor-saving machinery is refused and prohibitive costs forced on the builder. There is little to export in France, Italy or England, and until the rate of exchange improves they cannot afford to buy abroad.

Just as a story may be read from this abbreviated summary of European conditions, so also must it be recognized that all of the conditions are subject to change. The handicaps under which Europe is laboring are the very ones toward the removal of which the greatest energies are being exerted. A lull now may well mean a stronger foreign demand when the readjustment comes, and exports once started will have a stimulating effect all along the line that leads to the shipyard that builds the carrier.

Only from a survey of conditions the world over and the statistics of the present may any prediction be made. But the present has its opportunity for the reconstruction of ships and for the handling of that necessary business of building that is to come, and by grasping those opportunities that are here the builder will be in a position to accept the greater ones that may come.

THE PROPER SPELLING OF PIT RIVER

A comment on its practice of spelling "Pit" river with a single "t" led the Journal of Electricity to investigate the proper spelling of the word. Among the musty volumes of antiquity, one was found entitled, "Report of Exploration and Surveys to Ascertain the Most Practical and Economical Route for a Railroad from the Mississippi River to the Pacific Ocean." One of the duties of the party making the survey was to find the route for a railroad from the Sacramento valley to the Columbia river and in the diary of one of the members, under date of August 8, 1855, is the following:

"August 8. After fording the river which was about forty feet in width we continued our course through a level grassy valley bare of trees. Several grouse, ducks and curlew were shot on the march. We passed many pits about six feet deep and lightly covered with twigs and grass. The river derives its name from these pits which are dug by the Indians to entrap game. On this account Lieut. Williams (who was in charge of the party) always spelled the name with a single 't,' although on most maps it was written with two."

Another interesting story as to how Pit River received its name is told by one of the engineers on this project who states that the Indians living in that country have always dug pits in the ground when they were making camp and that when cold wind blew down from the hills they would build a fire in this pit and throw large stones into it. Then when it came time to go to bed they would throw out the fire and go to sleep out of reach of the wind and surrounded by the warm rocks which kept them warm through the night. This practice is still followed and for that reason he believes that the name of the river should be spelled with only one "t".

Applying the Self Interest Story

(Actual constructive support of the power companies in their plans of development by securing a widespread distribution of their stocks has been begun by the San Francisco Electrical Development League. An account of the meeting at which this work began and the working plan of the committee in charge of the sale of stock is here given so that other sections can follow the lead of this wide-awake organization in backing up the development of hydroelectric power which is so necessary to the development of the West.—The Editor.)

Last summer the Pacific Division of the Electric Supply Jobbers Association and the California State Association of Electrical Contractors and Dealers endorsed the power companies' plan of development and recommended that some steps be taken to secure a wide distribution of power company securities among their members. In October a committee was appointed from the Pacific Division of the Jobbers' Association to make a working plan for the sale of power company securities among the members of the industry and this committee reported the action of their association to the San Francisco Electrical Development League. Immediately a committee was formed from that organization to cooperate with the committee from the Jobbers' Association and a working plan was evolved.

W. S. BERRY

W. S. Berry, Western Electric Co., chairman.
Garnett Young, Garnett Young Company.
R. A. Balzari, Westinghouse Electric & Manufacturing Co.
Clyde Chamblin, California Electric Construction Co.
D. E. Harris, Pacific States Electric Co.
W. B. Sawyer, U. S. Steel Products Co.
Robert Sibley, Journal of Electricity.
J. A. Vandegrift, National Lamp Works.

Five teams of ten men each were selected, one team for each committeeman's direction, and the city was divided into five sections. A sixth team was selected to cover the east bay territory. The sections were drawn for by lot and a captain selected from each team further divided up his district so that two men would cover the same territory together. The captains were:

Team 1—H. C. Hopkins, Westinghouse Electric & Manufacturing Co.
Team 2—C. B. Kenney, NePage McKenny Co.
Team 3—Grover Anderson, Electric Appliance Co.
Team 4—H. S. Jones, Robbins and Myers Co.
Team 5—Lee Van Atta, Pacific States Electric Co.
East Bay Team—H. F. Rae, Pacific States Electric Co.; E. A. Crowson, Western Electric Co.; R. F. McDonald, Holabird Electric Co.; C. L. Gilson, Gilson Electric Supply Co.; J. D. Gregory, East Bay Electrical Trades Association; H. W. Kimball, Kimball Electric Co.; R. V. Oyler, Capital Electric Co.

Representatives of the Pacific Gas & Electric Company, the Great Western Power Company, and the San Joaquin Light & Power Corporation explained the subscription plans of their various companies to the captains and teams, and furnished them with subscription blanks.

With the loose ends all caught up, the plan of action laid and the teams properly coached, the stage was set for the December sixth meeting of the San Francisco Electrical Development League to sell the story to the members of the electrical industry, and convert them to the idea that it was necessary for the central stations to develop if the industry was to go ahead. Four hundred members of the electrical industry turned out to listen to this story, and seated at the head of the table were representatives of all branches of the industry. Garnett Young, president of Garnett Young & Company, was chairman of the day, and besides the speakers of the day the following men were at the head of the table: C. L. Tilden, Garnett Young & Company; Clyde L. Chamblin, manager, California Electrical Construction Company and president of the California State Association of Electrical Contractors and Dealers; J. F. Pollard, assistant to the president of the Coast Counties Gas & Electric Company; Dr. Thos. Addison of the General Electric Company; A. F. Hockenbeamer, second vice-president, Pacific Gas & Electric Company; E. O. Shreve, local manager, General Electric Company, president of the San Francisco Electrical Development League; C. E. Heise, local manager, Westinghouse Electric & Manufacturing Company; Mortimer Fleishhacker, president Great Western Power Company; W. H. Whiteside, Westinghouse Electric & Manufacturing Company; A. G. Wishon, vice-president and managerial director, San Joaquin Light & Power Corporation; W. S. Berry, Western Electric Company, and W. M. Shepard, commercial manager, California-Oregon Power Company.

"Bill" Shreve, in starting the meeting, said that the movement to assist the power companies by making all electrical men shareholders, long overdue, was now solidly orzanized and was about to be put over. Garnett Young then spoke of the necessity of backing up power companies by the industry, and stated that upon their prosperity depended the prosperity of the rest of the electrical industry. He then asked for a report of the committee to get the movement under way. W. S. Berry, chairman of the committee, in reporting stated the plan of the campaign and read the list of committeemen and captains.

E. O. SHREVE

W. P. L'Hommedieu, manager of the power division, Westinghouse Electric & Manufacturing

I HEREBY RESOLVE

(a) to encourage the electrical development of the West

(b) not to encourage golf for the office boy

JANUARY 1, 1921

Company, the first speaker of the day, then spoke on his subject, "The Kilowatt and the Dollar:"

"Of all the agencies which contribute to the comforts and conveniences of this twentieth century civilization," Mr. L'Hommedieu said, "electricity is the greatest. It enters into nearly every phase of our domestic and business life: transportation, communication, food production and preparation, light, heat, and the production of most of our necessities and luxuries. All of us here know something of electricity and electric power; its generation, transmission and utilization. It is our business to do so, but how often do we think of it in terms of its relation to the progress and development of our community?

"These charts will help to point out, in a crude way, perhaps, what the development of electric power means to the community at large; and in California, when we speak of electric power, we mean hydroelectric power. Before going any further it might be well to give a minute to the consideration of what a kilowatt and a kilowatt-hour mean.

W. P. L'HOMMEDIEU

"To the average consumer the latter is something he pays about eight cents apiece for, or less, if he buys a whole lot of them. Now, as eight cents will not buy very much in these days of the shrunken dollars, the kilowatt-hour appears insignificant because of its price. But translated in terms of good work accomplished, it commands our greatest respect. It will light your home brilliantly for the entire evening; run a loaded street car from the Emporium to the Palace Hotel; pump about 5,000 gallons of water for irrigation or do many other equally useful chores.

"Now in order that we may have one of these efficient workers busy twenty-four hours a day, it is necessary to develop in the mountains, transmit, and distribute one kilowatt of electric power. To do this requires properly harnessing and controlling something over ten gallons of water per minute, dropping down the mountains 600 feet, thus changing its potential energy into kinetic energy of the water wheel and thence into electric energy in an electric generator.

"Now look at chart number one and see what it means to harness this water and turn it into a kilowatt of electric power so that all of this work we want may be done, miles away by 'kilowatt-hours.' To harness this water means the construction of dams, ditches, tunnels, penstock, power house and, of course, the installation of 1 kilowatt in generating capacity. In order to strengthen up our kilowatt for the long journey from the mountains to San Francisco, we must liven him up by applying a potential of 100,000, 150,000 or 200,000 volts. This requires 1 kilowatt in step-up transformer capacity. It is interesting to note that this takes at least $140 to accomplish; that is, to make 1 kilowatt available at the transmission line.

"Next, we must provide a suitable path for transmitting our kilowatt of power to a central point from which it may be distributed to the various points of utilization. This involves the purchase and construction of towers, installation of insulators, miles of copper or aluminum wire, and 1 kilowatt in step-down transformer capacity, at a cost of $70.

"From this point must be run out a network of distribution lines with distribution transformers, meters, etc., to carry this 1 kilowatt to its several destinations. It costs $140 for distribution capacity to take care of 1 kilowatt in generating capacity.

"By adding these figures together we have reached a figure of $350 for each kilowatt installed in order to make hydroelectric power available for the community. In addition to this it is of course necessary to install electrical equipment in our factories, homes, etc., and to wire these up; all of which costs another $750, so that we have a grand total of $1,100 representing the cost of equipment and labor for making this 1 kilowatt of electric power generated do its final work in the factory, on the farm or in the home.

"So much for the share taken by the electrical industry in this work. Let us see what it means to the community in general. What is being accomplished by electricity in and for the community now?

"On chart number two you will see what a quarter of a million kilowatts already developed by one of California's large companies, is doing in the way of service to the public. Allowing five persons to a home we have this one-quarter million kilowatts providing domestic service for a million people, irrigating enough land to more than feed them and operating factories enough to provide employment for a large percentage of the heads of these homes.

"The normal growth of the electric power demand is something like 10 per cent per year, and in order that our community shall grow and prosper this additional service must be provided. Using this same company as an example, they must provide and are planning to provide not less than 25,000 additional kilowatts per year.

"Now look at chart number three, and we find that 25,000 kilowatts additional power developed means in additional invested wealth over 150 million dollars, or six thousand dollars per kilowatt of power developed. Now chart number four—one kilowatt of additional power developed at a cost of $350 makes possible the building of one home, irrigating four acres, and the employment of one person in an industry; which means six thousand dollars to the community.

"Figures are sometimes dry and hard to remember, but I think this last one is worth carrying away: That every additional kilowatt means six thousand dollars increased wealth. It has been said many times that California's prosperity is absolutely dependent upon her hydroelectric power development—and truly said; therefore the converse of chart number four is true—that to increase our wealth six thousand dollars, we must develop this additional 1 kilowatt of hydroelectric power.

"We of the electrical industry must not only believe this ourselves, but must believe it so thoroughly and well that we spread the gospel on every hand to the extent that our fellow citizens may have a true appreciation of this wonderful gift which nature has bestowed upon us, and a determination to support the institutions which enable that gift to be utilized to its fullest extent."

Introducing Emory Wishon as "the little dynamo from the San Joaquin," Garnett Young stated that he was most efficient when running at high speed, and as far as the electrical industry was concerned there was no one who would say that Emory was not always working at high speed. Mr. Wishon said in part:

A. EMORY WISHON

"The development of the Pacific Coast depends entirely upon electrical development. It may be argued that the future of the electrical industry on the Pacific Coast is uncertain as we face a financial and great labor problem. It is true that from the greatest financier to the ex-bartender this problem is being considered, but for once the common answer seems to prevail — constructive conservation and more production. Constructive conservation is the answer, and more production on the part of every industry, business or individual. The public as a whole is talking constructive conservation and more production. Is there any industry in the world today that stands ready to do more in the production of essentials, in the conservation of labor, fuels and materials, than the electrical industry? We who have studied the problems of the development of the West know that the West will not develop ahead of its hydroelectric development. The greater portion of western territory depends upon hydroelectric development for irrigation of its arid lands if agriculture is to be further extended and increase of agricultural production made possible. If factories are to be built in the West, cheap power must be obtainable in order to conserve fuel and labor. If work is to be added for the laboring man, development must continue. I will cite the instance where delay on the part of a power company due to its inability to serve 600 new agricultural applicants in Fresno county caused a study to be made as to the effect of this delayed development on local industry and the effect of electrical development on labor and local indus-

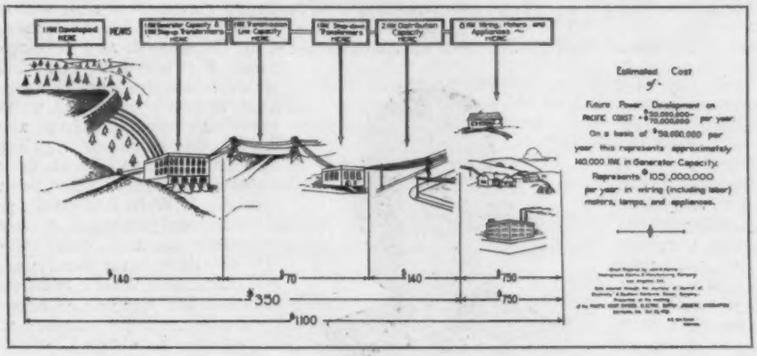


Fig. 1—This graphic diagram shows what the development of one kilowatt means to the electrical industry in dollars and cents and is an excellent argument for the members of the industry supporting the central stations in their financing of the big construction now under way.

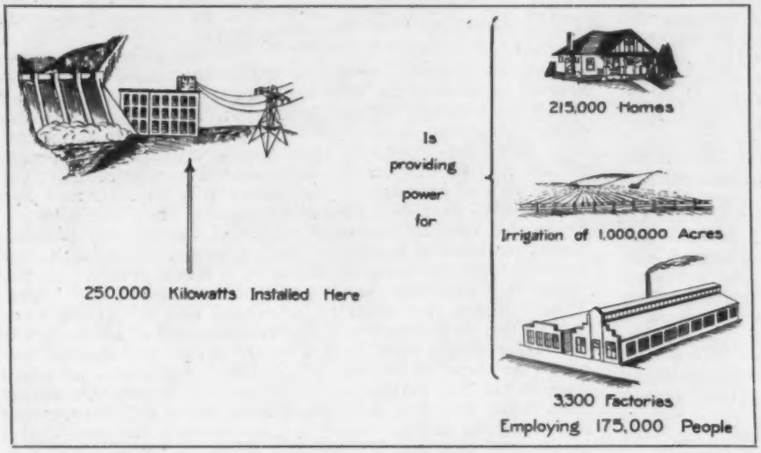


Fig. 2—The relation between kilowatts generated and community development, and the benefit derived by the community is clearly shown in the accompanying diagram. These figures should be used in central station advertising to rouse the public to a realization that the money spent in developing the resources of the state will be returned to the community served.

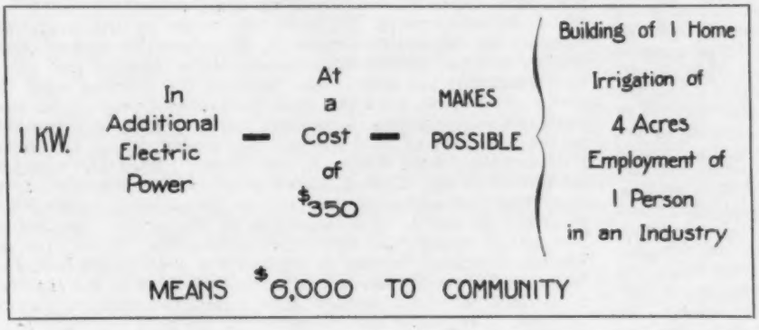

1 KW.
In Additional Electric Power
At a Cost of $350
MAKES POSSIBLE
Building of 1 Home
Irrigation of 4 Acres
Employment of 1 Person in an Industry
MEANS $6,000 TO COMMUNITY

Fig. 3—If the development of one kilowatt of hydroelectric energy means $6,000 to the community, it is an easy matter to find out the number of kilowatts to be developed by the local power company, and to convert that into the sum which the community will realize on account of the development.

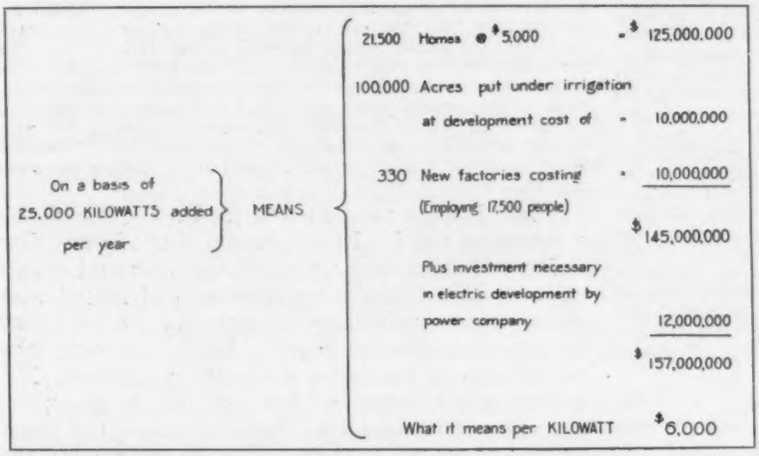

On a basis of 25,000 KILOWATTS added per year
MEANS
21,500 Homes @ $5,000 = $125,000,000
100,000 Acres put under irrigation at development cost of = 10,000,000
330 New factories costing (Employing 17,500 people) = 10,000,000
$145,000,000
Plus investment necessary in electric development by power company 12,000,000
$157,000,000
What it means per KILOWATT $6,000

Fig. 4—The characteristic power house of today will develop approximately 25,000 kw., and the fact that this power house not only generates electric energy but dollars and cents for the community is often lost sight of by most of the people. This chart shows that the ratio between the money invested in generating 25,000 kilowatts and the return to the community served is better than twelve to one, and that a community depends upon population and power for its industrial growth.

try. In Fresno county in 1910 there were 16,799 homes and 6,245 farms; or approximately two homes in town for every one in the country. It was therefore apparent that when electrical service was rendered and 600 new farm homes constructed 1200 new town homes would be constructed, or 1800 additional homes would be built directly due to electrical development, and this does not include commercial buildings, factories or other construction made necessary to handle the products of the 600 farms and to supply the trade which is made possible through this agricultural development. The cost of the average town home in this locality, including building site, is $6,000, and of the country home, without building site, $5,070, or a total building construction program of $10,242,000. The study was then made of the materials and labor that went into the average home and it was shown by curves that were indisputable that the carpenter trade would receive 15½% of this delayed building program, that the lumber man would receive 14% and that the plumber would receive 3.85% of this amount, and so on.

The San Joaquin Light & Power Corporation furnishes current to nearly 3,000 oil wells. The average well uses approximately 100 kw-hr. daily, and yet if this well were operated with an individual steam plant the average daily use of oil would be in excess of two barrels per well operated. Practically all the power that goes to supply these wells is hydro and consequently these full two barrels of oil per well is conserved, or estimated at 2500 wells operated, a conservation of 5,000 barrels per day or 1,825,000 barrels per year. But the public does not understand the electrical language and it must be driven home to them in terms of self-interest, by proving to the individual of that public what the electrical industry is doing for him, what the electrical industry means to him in dollars and cents, and what lack of electrical development means to him in loss in his individual business. Prove your case to the individual by proving where that individual's pocket book is hurt when your business is hurt, and you will have a convert who will see that your business shall prosper. It is no new theory, it is as old as man. Self-interest is that element that causes strife, war, ambition, strikes, profiteering, and even enters into love. It is largely responsible for the present unsettled conditions, yet it can be capitalized to the benefit of the electrical industry and for humanity. It is a solution of the present national condition, and the Golden Rule—probably the only passage in the Bible that is left entirely to individual interpretation today—is simply a rule of right and wrong based upon self-interest. This cooperation that you men are exhibiting here today is due to self-interest, for you know that unless that power company has the power to sell to the public you cannot distribute your goods, you cannot sell your appliances. You manufacturers cannot manufacture unless you have a market to dispose of your goods, and that market is not there unless the power companies have the money to expand and the power to sell. Can you sell this idea to others? Can you show your man what the increased development of hydro-electric power means to him individually? To make this possible we are the foundation upon which all future development of the West must be built. To continue we must finance, to finance we must have a protected investment and a fair rate of return. It is necessary that people understand this story and, that the people may be made to understand, the story must be told so that the individual interest is appealed to, and that individual interest can only be secured by proving to the individual what electrical industry and development mean to him in dollars and cents, in better standards of living, in more production and greater conservation. His self-interest must be developed. This is a big undertaking but it can be done when every man in the electrical industry knows the story, knows the story so that it hurts, knows it so that he has to tell it, and will tell it at the dinner table—every place he goes, sell the idea; tell it to his wife and to his mother-in-law and if he can sell them, he can sell the idea to the public. While you are out selling stock, don't sell your man the stock unless you can sell him the story; go after him right and sell him the story first, then sell the stock. If you can sell him the story, you can sell him the stock, but don't sell the stock without the story. It is merely a matter of self-education and believing and telling the story, and if you can put this story over and put it over right, you will have no worries about the future of the development of hydro-electricity in this state."

Mr. Wishon was followed by Mr. John A. Britton, vice-president and general manager of the Pacific Gas & Electric Company, who spoke as follows:

"The uncertainty of the future at the present time seems to be worrying a great number of our leading business men, but I have such an absolute belief in the growth and development of California and this western empire that I fully and earnestly believe it must grow and expand. There are 22,000,000 acres of arable land in this state and only 4,000,000 of these have been cultivated. With 9,000,000 hp. running to waste in our mountain streams, only 942,000 hp. have been developed. As there is a direct relation between the number of acres cultivated and the number of kilowatts developed, other acres of this fertile land of ours when cultivated will require in direct proportion more power.

JOHN A. BRITTON

"The power companies of this state cannot progress unless they have the wholehearted support of the electrical industry, and the easiest way to sell the necessity for the development of California's hydro-electric resources is by a 100% cooperation within the industry. The interest of this state begins with the development of the land of this state. Expressed diagrammatically, the percentage of increase in population, in acres cultivated and in the power developed runs along parallel lines, but kilowatt-hours and kilowatt installed capacities do not run parallel. They run ahead on account of the low price of electrical power which is and has been conducive of a much greater use per capita in California than in any other state of the Union. A still greater use must be developed and we should work toward the electrification of the railroad and of all the great industries which have located in the state, and develop our resources ahead of the demands so that we will have an added inducement for additional industries. Northern California must wake up, Los Angeles is advertising and cooperating and is getting ahead. San Francisco has as great possibilities as the southern part of the state; it has a better climate, is more conducive to hard work, but the northern part of the state must make its countryside more attractive. If $500,000,000 is to be spent in the next ten years by the electrical industry in construction work in this state, let us not only talk of this but talk of what the electrical industry and electric companies are now doing, then tell the story of what is going to be done, visit the vast construction projects of the various power companies, so that you may talk intelligently to the investors as to where all this money goes. Fourteen million homes need wiring in the United States and 150,000 industries in the United States need to be electrified, and this gives some idea of the vast future which is before the electrical industry. The salvation of the power companies lies in the widespread sale of securities, the Pacific Gas & Electric Company having at the present over 31,000 holders. With such a widespread sale of securities, there is the answer to the theorist who is clamoring for public ownership of public utilities. The people are the owners of the public utilities and no longer are they controlled by small groups of capital. The public utilities are merely trustees for the people. As a matter of fact they are contractors doing business on a cash basis and the public should be made to understand this. The more stockholders public utilities have the safer they are from unjust restrictions and the further they can go for the betterment of the general public good, which must mean a reduction in rates. In selling this stock you must not talk of any particular power company; talk of all and talk for all, for we must be united in the common interest of developing the state and the Pacific West."

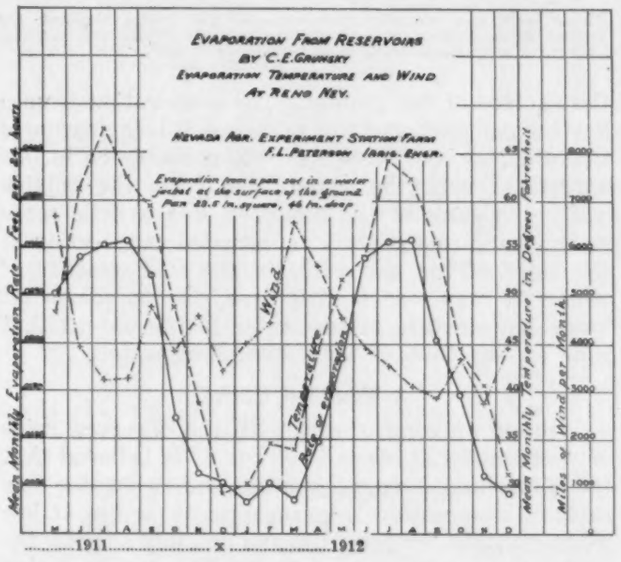
Mr. Britton then showed pictures of the developments on the Pit River project of the Pacific Gas & Electric Company, which he stated would eventually develop 500,000 horsepower, and stated that these pictures would give the men who are out to sell securities an idea of what is being done with the money that is loaned to the power companies. Mr. Britton also brought out the fact that to go over a job after it is completed does not show the great amount of money that was spent in overcoming the many difficulties encountered.

Figuring Evaporation from Temperature Records

BY C. E. GRUNSKY

(One of the western power companies recently figured a loss of approximately one-third of its stored water from evaporation—and yet this important factor in power development is but little understood by engineers and power men. The author, who has had extensive experience with these problems, here offers the theory that evaporation, taken in its yearly average, is directly proportionate to temperature, and presents an empirical formula corrected for altitude which may be used in calculating anticipated evaporation for any given reservoir site.—The Editor.)

The controlling factor, far outweighing any other factor, which influences the rate of evaporation from an open body of water, is temperature, and, particularly, the temperature of the water at the surface. The effect of wind and of humidity of the


EVAPORATION FROM RESERVOIRS
BY C.E.GRUNSKY
EVAPORATION TEMPERATURE AND WIND
AT RENO NEV.
NEVADA AGR. EXPERIMENT STATION FARM
F.L.PETERSON IRRIG. ENGR.
Evaporation from a pan set in a water jacket at the surface of the ground. Pan 23.5 in. square, 46 in. deep
Wind
Temperature
Rate of evaporation
Mean Monthly Evaporation Rate — Feet per 24 hours
Mean Monthly Temperature in Degrees Fahrenheit
Miles of Wind per Month
1911
1912

The temperature and evaporation curves show a close relationship, whereas the wind seems to have had but little influence on the evaporation rate. —Fig. 1.

air upon the rate of evaporation are secondary. With this fact in mind it occurred to the writer some years ago to attempt to establish a relation between the mean monthly temperature of the air and the mean monthly rate of evaporation.

Variations in Water Temperature

In some measure the water temperature of the pond, reservoir or lake will follow or will change with the temperature of the air, provided that a considerable period of time, preferably about a month, is taken into account. With this thought in mind the results of evaporation observations conducted under the writer's immediate supervision for the State Engineer of California (Wm. Hammond Hall), at Kingsburg on Kings River, 1881 to 1885, were brought under study. These observations had been made to determine in a simple, practical way the evaporation losses from reservoirs, rivers, and canals in the dry climate of California's interior regions or generally, when the climatic conditions were the only basic data available. It must, of course, be admitted that other factors besides temperature influence the rate of evaporation, but these are similar in their effect throughout regions of similar climate and are, when the total annual evaporation is to be determined, of so much less effect than temperature, that, for approximation purposes, the controlling factor alone need be considered.

Evaporation Curves From Observation

To illustrate how evaporation follows a mean monthly temperature and to what extent the rate of evaporation is affected by the wind, a diagram, Fig. 1, is presented showing the results of observations by Irrigation Engineer F. L. Peterson, in 1911 and 1912 at the Nevada Agricultural Experiment Station Farm. The relation is shown in this diagram between the rate of evaporation, the mean monthly temperature and the aggregate monthly miles of wind. It is difficult to see in this diagram any material influence of the wind, while there is a marked similarity in the shape of the evaporation and of the temperature curves.

The Kingsburg observations extended over a period of four years. They include a record of water losses from a pan floating in the river and from a pan on shore. The pan on shore was at first placed on a bridge, but, being too exposed in this position, was soon transferred to a convenient place on the ground with sand banked around it to above the water line. Each pan was about 15 inches deep and had, in its center, a one-inch peg or pin brought to a point at the top, 4 or 5 inches below the top edge of the sides of the pan. The pans were constructed of galvanized iron and were square, 3 feet on the side. The floating pan was surrounded by a raft so arranged as to break waves and prevent water from being splashed into the pan by wind. The observer was provided with a cup of such size that each cup of water represented .001 feet in depth over the area of the pan. He was instructed to add water to the pan whenever the water surface had fallen an eighth of an inch or more below the top of the peg. During the winter, whenever the rain threatened, an observation was taken and after the rain the water above the top of the peg was bailed out, a record being kept of the number of cups of water thus removed. Temperature was noted daily of the water in each pan, of the water in the river and of the air.

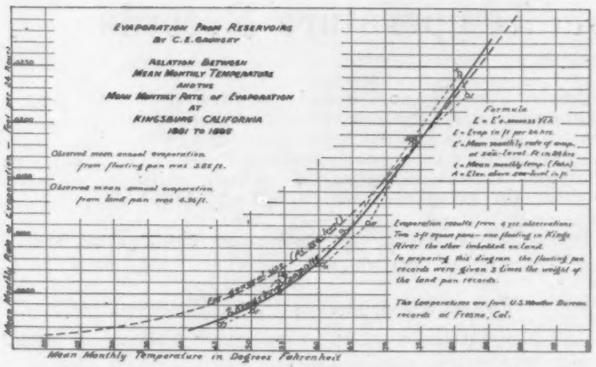
The results of these observations in condensed form averaged for the four years are as shown in the following table:

I HEREBY RESOLVE

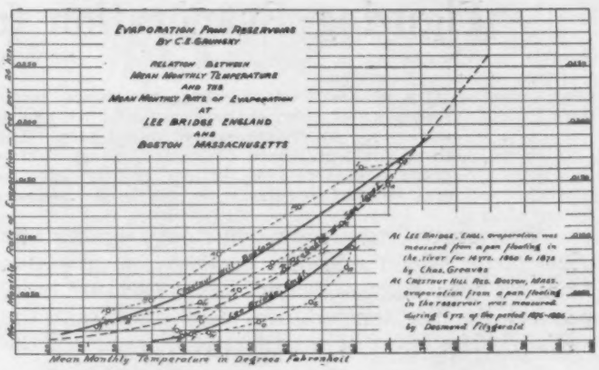
(a) to turn over my stock frequently

(b) not to turn over on the railroad track—a telegraph pole is less hazardous

JANUARY 1, 1921


Evaporation From Reservoirs
By C.E. Grunsky
Relation Between
Mean Monthly Temperature
and the
Mean Monthly Rate of Evaporation
at
Kingsburg California
1881 to 1885
Observed mean annual evaporation from floating pan was 3.82 ft.
Observed mean annual evaporation from land pan was 4.36 ft.
Formula
Evaporation results from 4 yrs. observations
The 3 ft square pans—one floating in Kings River the other imbedded on land.
In preparing this diagram the floating pan records were given 3 times the weight of the land pan records.
The temperatures are from U.S. Weather Bureau records at Fresno, Cal.
Mean Monthly Temperature in Degrees Fahrenheit

Curve based upon four years' observations at Kingsburg on the Kings River, California, and the curve of probable evaporation plotted from the evaporation formula worked out by the author.—Fig. 2.


Evaporation From Reservoirs
By C.E. Grunsky
Relation Between
Mean Monthly Temperature
and the
Mean Monthly Rate of Evaporation
at
Lee Bridge England
and
Boston Massachusetts
At Lee Bridge, Engl., evaporation was measured from a pan floating in the river for 14 yrs. 1850 to 1872 by Chas. Greaves
At Chestnut Hill Res. Boston, Mass. evaporation from a pan floating in the reservoir was measured during 6 yrs. of the period 1875-1886 by Desmond Fitzgerald
Mean Monthly Temperature in Degrees Fahrenheit

Curves based upon extended observations at Lee Bridge, England, and Boston, Massachusetts, are in substantial agreement with the basic sea level curve of probable evaporation.—Fig. 3.

TABLE 1

Evaporation at Kingsburg, California, November, 1881 to October, 1885 Temperatures at Fresno, 20 Miles from Kingsburg Based on U. S. Weather Bureau Records

Month	Temperature of the air Fahrenheit	Evaporation in Ft. per 24 Hours Floating Pan	Land Pan	Composite
January	45.3	.0021	.0026	.0022
February	50.2	.0036	.0033	.0035
March	54.4	.0066	.0073	.0068
April	60.8	.0071	.0095	.0077
May	67.4	.0091	.0178	.0113
June	74.1	.0161	.0259	.0185
July	82.1	.0203	.0292	.0225
August	81.0	.0233	.0278	.0244
September	73.8	.0180	.0205	.0186
October	64.2	.0109	.0093	.0105
November	54.6	.0059	.0058	.0059
December	47.0	.0032	.0034	.0032

The composite rates based on the Kingsburg records as noted in Table 1 are based on the records of evaporation from the floating pan and from the land pan. The floating pan record was given three times the weight of the land pan record. This was done because it is believed that the evaporation from the pan floating in Kings River was somewhat less than would have been observed from a pan floating on a large open water surface. The pan in the river had some protection against wind and the full effect of sunshine by high river banks, a fringe of low trees, and a near-by bridge. It is also probable that during a considerable portion of the year the river and, therefore, the water in the pan as well had a somewhat lower temperature than would have been found at the surface of a large open body of water. The land pan on the other hand undoubtedly lost more water than would have been lost from an open water surface.

The rates of evaporation thus determined as an approximation from an open water surface at Kingsburg have been plotted in their relation to the mean monthly temperature, as shown in the diagram Fig. 2.

Pan and Open Water Evaporation

The exact relation of the daily or monthly rate of evaporation from an open body of water such as a storage reservoir, to the measured rate from a pan of considerable size (not less than 3 feet square) imbedded in the ground, can not be given. It appears probable, however, that the annual evaporation from a lake or reservoir is about 75 to 80 per cent of the annual evaporation from a land pan 3 ft. sq. imbedded to such depth that the water surface in the pan is at the surface of the ground. The evaporation from a floating pan anchored well off shore, it being assumed that the pan is of large size, will probably be in fair agreement with the evaporation from the outside water. In summer the pan may lose a little more water owing to a slightly accentuated evaporation at the sides of the pan while in the cold weather of winter it may lose a little less, due to somewhat lower temperature of the water in the pan at that time of year than of the surrounding water.

A Modified Curve

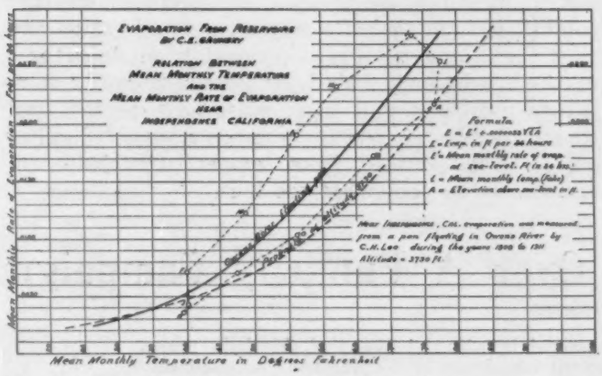
Based on comparisons with the observed rates of evaporation at other localities, it is believed that the Kingsburg records indicate somewhat too low rates of evaporation from open water bodies at low mean monthly temperature, and possibly slightly too high rates at high temperatures. This consideration and comparison with other results has led the writer to propose a modified evaporation curve for general use, substantially as indicated in the last column of Table 2 and as shown in Fig. 2.

The full line curve in this diagram shows the probable relation between the mean monthly temperature and the mean rate of evaporation as indicated by the Kingsburg observations. The probable mean monthly rates of evaporation thus determined were originally assumed to be strictly applicable only to regions in which the climate is similar to that of the interior of California, but it was found to give fairly dependable annual results under almost any weather conditions.

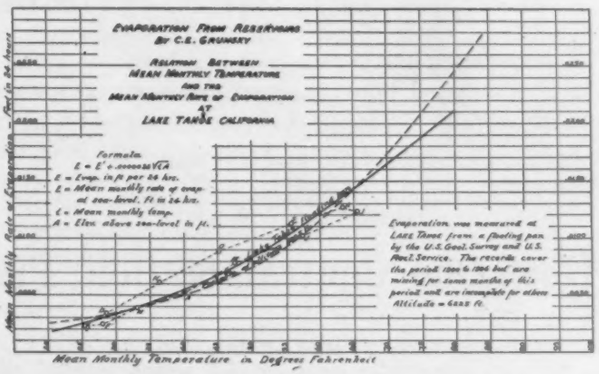
Applied to the Salton Sea in the Imperial Valley for a year from 1908 to 1909, the calculated evaporation agreed very closely with that based on a determination of the fall of the water surface corrected for rainfall and inflow.

Applied at Gatun Lake on the Isthmus of Panama it seemed to give as close an approximation to the loss of water from the lake as was obtainable by other methods.

In Table 2 the relation between mean monthly temperature and the mean monthly rate of evaporation is shown as determined from the Kingsburg curve, and as recommended by the writer for general use when annual evaporation is to be estimated.



Evaporation records from Owens Valley, California, give a similar result. The curve of probable evaporation is here corrected for altitude according to the author's formula.—Fig. 4.



Lake Tahoe curve based upon figures covering a period of six years, compared with a curve of probable evaporation corrected to an altitude of 6225 ft.—Fig. 5.

TABLE 2

Relation between Mean Monthly Temperature and the Mean Monthly Rate of Evaporation, Based Mainly on the Kingsburg Observations

Mean Monthly Temperature F.	Evaporation from Open Water Surface Mean Monthly Rate in Ft. per 24 Hours	
	Kingsburg Curve	For General Application at Sea Level
25		.0015
30		.0019
35	.0010	.0025
40	.0016	.0033
45	.0025	.0043
50	.0038	.0056
55	.0055	.0073
60	.0080	.0095
65	.0110	.0121
70	.0147	.0151
75	.0187	.0186
80	.0228	.0223
85	.0270	.0260
90	.0312	.0300

It seems to be well established that the rate of evaporation increases slightly with elevation above sea-level. In the absence of any conclusive data relating to the rate of this increase the following empirical formula is suggested for use until something better is offered.

$$E = E' + .0000033 \sqrt{t\,A}$$

Where E is the mean monthly rate of evaporation in feet per 24 hours; E′ is the mean monthly rate of evaporation at sea-level; t is the mean monthly temperature, and A is the elevation in feet above sea-level.

For comparison with the Kingsburg evaporation record four other evaporation curves based on observations of the loss of water from floating pans are presented in Figs. 3, 4 and 5. These represent results of observations at Lee Bridge, London, covering 14 years, 1860-73, by Mr. Charles Greaves; at Chestnut Hill, Boston, covering 6 years of the period 1876 to 1886 by Desmond Fitzgerald; in Owens Valley, California, covering a 3-year period from 1909 to 1911 by C. H. Lee, and at Lake Tahoe, covering a 6-year period, 1900 to 1906, by the U. S. Geological Survey and the U. S. Reclamation Service, but with some gaps filled by interpolation.

Seasonal Variation

It is interesting to note that in the case of all these records, except only in the case of the Kingsburg and Lake Tahoe records, more evaporation is shown in the spring and early summer months for any given mean monthly temperature than in the fall months for the same temperature. This may be due in part at least to the fact that in spring there is a progressive rise of temperature representing increasing capacity to receive moisture on the part of the air, while in the fall this condition is reversed. Other contributing factors are the differences in the wind movement; in the humidity of the air, and in the daily range of temperature.

The curves in Fig. 2 and rates of probable evaporation noted in Table 2 are, therefore, less dependable when evaporation is to be approximated for any single month for which mean temperature of the air is known, than for an entire season of 12 months. Any deficiency of the estimate in the spring months, in the latter case, will be offset by corresponding over-estimates in the fall months.

It is to be noted that many published records of evaporation are not dependable because the conditions under which the observations were made are not fully set forth.

Factors Affecting Pan Evaporation

The evaporation from a pan filled with water is materially affected among others by the following factors:

1. The size of the pan.
   Evaporation increases as the aggregate length of the sides of the pan or its circumference in relation to its water surface area increases. This is particularly true of land pans. The small pan will show more evaporation than the large pan. The pan should have a surface area of at least 9 sq. ft. The water in the pan should be at least 10 inches deep.
2. The location of the pan.
   The evaporation pan should be fully exposed to sunshine and wind. The land pan should be imbedded or should have soil banked around it so as to bring the water surface flush with the surface of the ground. The floating pan should be in deep water well off shore and should have its water surface at exactly the level of the surrounding water.
3. The protection of the pan.
   The floating pan should be surrounded by a raft so arranged that wind will not splash water into the pan and that riffles striking the sides of the pan will be minimized. Both the floating pan and the land pan must be kept free from floating litter such as leaves or twigs, which accelerate evaporation.

I HEREBY RESOLVE
(a) to better my business methods
(b) not to bet her—she doesn't like to lose
JANUARY 1, 1921

Observations will be more dependable if the quantity of water required for the replenishment of an evaporation pan is measured in a bottle neck vessel or is weighed, than if a direct measurement to the water surface is attempted at each observation.

Corrections for Special Conditions

In conclusion it remains to be said that the determination of evaporation from known weather conditions is necessarily only an approximation and that for single months occasional wide departures of the predictions based on mean monthly temperature from actual facts must be expected, and that in months in which there are protracted rains, any rate determined from temperature alone will necessarily be somewhat too high.

How One Central Station Put Over A Publicity Campaign

BY A. E. WISHON

(Powerful comment throughout the West has appeared in editorial pages of the daily press concerning the expeditious manner in which the recent completion of the Kerckhoff development of the San Joaquin Light & Power Corporation was accomplished. Along with this physical accomplishment was consummated a most effective publicity campaign. The editor of the Journal of Electricity has, as a consequence, written to the assistant general manager of the San Joaquin Light & Power Corporation to get from him a detailed statement of how this was accomplished, hence the article appended herewith.—The Editor.)

In accomplishing the splendid publicity detail worked out by this company during the past year, we undertook the work from many angles. First, we spent money in paid advertising and these advertisements were carefully edited and studied and followed a line of thought from beginning to end. In other words, we worked out an ultimate plan of what we would lead to and knew what the last chapter of the book was to be before we published the first. These paid ads are necessary in order to create a friendly relationship with the newspaper, but even with the paid advertisement you cannot expect the newspaper to publish propaganda in any news column unless that propaganda is real news to the public. Especially on this point I believe our publicity department made good. We gave the newspapers real news but into that news we wrote a sentence, a paragraph or a story, as the case might be, of propaganda. We tried even the report of an accident, which in general we all hesitate to publish. If an accident occurred and it had to go into the papers, we generally wound up with the statement that the man was engaged in a "herculean" effort that was being made to furnish power to the thousands of farmers that were waiting for service. We got the story across hundreds of times in different languages and it was read as news and was news because we did not try to pass something to the paper that was purely propaganda without news value.

Taking Friends Over the Job —

But the newspaper does not in any way cover the publicity field. During the construction of the Kerckhoff plant we spent considerable money in taking the legal fraternity, the merchants, bankers, ministers, Rotary Clubs, Commercial Clubs and every other business organization and class that you could think of over the job. Our organization was trained to tell the story of how urgent work has been completed in record-breaking time, of the necessity of financing such development for the prosperity of all lines of business in the San Joaquin Valley.

At every opportunity last year we had men before the different civic organizations telling our story of development and our relation to general progress in a manner that put it across.

The Kerckhoff Opening —

On the completion of this Kerckhoff job we sent out thousands of invitations to the opening. We featured the construction work so that on the completion of it the papers gave us practically a page announcing the opening, and on the day of the opening over 2500 were there, forty miles from Fresno, over mountain roads with the temperature 109 in the shade. We had red lemonade stands in every shady place for miles approaching the plant, and when they arrived served them with an elaborate buffet luncheon. Opening ceremonies were also held and records made in construction were outlined, the costs of the job given and the story of what it meant to the public was told again.

Senator Raker, U. S. Congressman Harry Barbour, Chester Rowell, editor of the Republican, Paul Redington, head of the Forestry Service, F. H. Fowler, head of the Water Department, W. G. Kerckhoff, president of the company, A. G. Wishon, manager of the company, and Rex Starr, construction engineer on the job, all took part in the program.

As a feature of the program the Government Department of Air Service volunteered to run a number of ships in the mountains. The Varney Lincoln Aeroplane Company sent an airplane in to scatter messages of welcome. The Government Radio Department installed their wireless telephone free of charge to us. We had a wireless telegraph working carrying messages between our Fresno office and Auberry, in fact apparently between all points of the valley and Auberry, though we used our private telephone lines to transmit these messages from Fresno out.

These were just a few of the stunts which made the celebration worth-while from a news standpoint as well as very interesting to those on the job, and as a follow-up the newspapers were full of it and we received hundreds of letters from all parts of the valley and many editorials. In addition to all this and to the fact that every man on the job was trained to tell the story, we had a large board of photographs

of the construction work in progress, showing the plant from inception to finish at all stages of construction.

In addition to this we had writing tables arranged with sets of postal cards of our properties, furnished free stamps and mailed over 10,000 cards written to friends of those who witnessed the opening.

I have gone into a lengthy discussion simply to outline what I mean by the statement that there is more to publicity than the newspaper publicity and to writing paid ads.

Some have suggested a paid advertising man for central station work generally, but I do not agree with the idea at present. It's a matter of policy, possibly a matter of a clearing house for the interchange of ideas, but news must have a local touch to be real news and to continue such news must be created locally and handled locally by local contact with local papers. I am very much of the opinion that we all have a common interest in seeing proper information and proper propaganda put before the public and we can all afford to spend a considerable amount of money in this cause, for a clear understanding of the necessity of public utility development will stabilize public utility securities and will eventually place them with the public at a lower cost to the utility.

Utilizing Surplus Power

(Saving fuel in the power plant by using the surplus power for feed water heating, by means of a water rheostat, is an economy which is being effectively practiced by a large northwestern power company. The installation is described in the following article.—The Editor.)

With surplus power available during the winter and spring, the Washington Water Power Company has found it practicable to institute a water rheostat to take the place of the ordinary steam feed water heater. This was installed in October, 1919, and it is figured that from 300 to 500 tons of coal a month have been saved, an appreciable item when the costs of coal during a period of shortage such as that which prevailed last winter is taken into account. As the power used in operating the rheostat would be wasted under other circumstances, this gain may be said to have been effected at no cost to the company other than that of the original installation.

The three-phase, 2300-volt rheostat as now installed consists of a tank ten feet in diameter situated on the roof of the heating station, with a triangular framework on which the electrodes are mounted and which can be raised and lowered at will, according to the current required. Galvanized sheet iron pipe of 8 and 18 inches diameter respectively and six feet in length is used as electrodes, arranged in triangular formation as indicated in the accompanying diagram. In order to facilitate circulation of water, a 2-inch open vertical slot is left in each of these pipes, thus allowing the central core of water free access to the open tank. Water enters in the center through a 4-inch capped inlet pipe which stands six feet high, having three vertical rows of holes for distribution of the water. A spray located a few feet above the tank prevents surface heat losses which would result from the violent boiling of water in the vicinity of the electrodes.

The present form of inlet pipe is the result of some experimenting. An inlet at the bottom of the tank with a baffle plate close above it to spread the water was first tried but proved unsatisfactory owing to the sharp line of demarkation which was left between the cold and warm water. This made it possible for boiling hot water to be drawn from the surface of the tank while the lower levels were entirely cold, a situation which could not be judged from the thermometers below, which indicate only the temperature of the water in the outlet pipe. It was thus possible for the rheostat to be badly overloaded without the fact being recognized. The present system keeps the water thoroughly mixed, so that any overloading results in a general lowering of temperature and is immediately apparent.

A similar series of experiments were gone through to determine the most effective connections for the outlet, during which an interesting difficulty in the formation of lime developed. The outlet arrangement as first planned provided for three 4-in. outlet standpipes, terminating in 12-inch funnels located six inches below the rim near the sides of the tank. These ran into a 6-inch pipe which carried the water through various connections to the boilers. The city water which was used for the steam plant was of eight degrees hardness and it was soon found that the boiling of the water in the rheostat precipitated lime in quantities which greatly interfered with its effective service. Within two months time, the outlet pipe was stopped up until there was not more than one-inch diameter effective conduit. An effort was made to clear the pipes with acid but it was found that this did not eat away the coating evenly and in sections where the pipe was horizontal and the acid inclined to run along the bottom, the pipe itself was reached before the upper coating was at all attacked.

In order to obviate this difficulty, a new set of piping has been put in which does away with the small pipes, substituting two large pipes, which take the water horizontally from just below the surface. These are laid out in straight lines with T instead of L connections at the elbows, so that they can readily be swabbed out. It had been the custom to utilize the former feed water heater through which the water passes on its way to the boilers as a water

I HEREBY RESOLVE

(a) to figure in overhead
(b) not to figure in the lists of Ponzied financiers

JANUARY 1, 1921

softener, but the water is now given the soda-ash treatment in the rheostat itself. This results in the precipitation of a soft sludge which is swabbed out about every six weeks, a simple process which occupies not more than three hours' time. The former

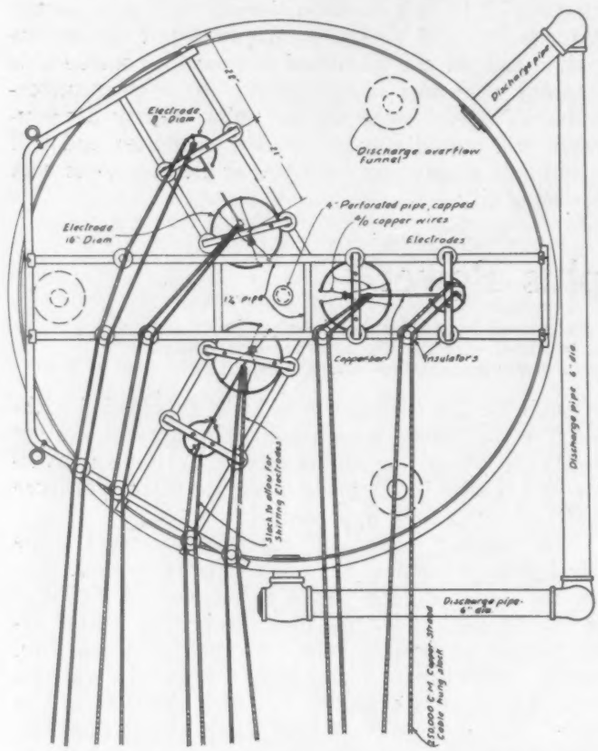


Diagram showing scheme of connection in water rheostat, with iron pipes used as electrodes.

method was especially designed to facilitate drawing of the hottest water, but it is found that the service is satisfactory under the present system.

An interesting feature of the installation has been the freedom from electrolysis or any acidity of the water. Considerable doubt had been expressed before the rheostat was tried out as to its practicability, owing to predicted electrolytic action which would have pitted both piping connections and boilers. In order to be on the safe side in this matter, tests were made to determine if the action of the 2300-volt current would have any effect on the water injurious to the boilers or piping. A small 2300-volt, three-phase rheostat was made in an iron tank and samples of the water were put through a very thorough analysis by a chemist. Samples were taken after boiling for five hours in an ordinary manner and also after boiling five hours under continuous arcing at the electrodes. In neither case was any trace of acid or excess free oxygen found in the water. The only difference in the water samples taken before and after the five hours' electric boiling was a lower lime content due to boiling and higher nitrites and nitrates. The results in practice have upheld the outcome of this experiment, no difficulty whatever having been experienced in pitting, even in the galvanized iron electrodes themselves.

The rheostat is connected between the city water supply and the former steam heater and purifier, the water still passing through its former course, so that in case of any trouble with the rheostat, or an overloading due to an unexpected demand, the steam heater could again be utilized without interruption of service. The demand varies from 180,000 lbs. of water per hour during the coldest days of winter to about 30,000 lbs. for the summer load. The rheostat is designed to handle 100,000 lbs. of water per hour without any reduction of temperature, which is maintained well above 200 degrees. As the resistance varies inversely with the water temperature it is inadvisable to allow the temperature to fall much below the boiling point, since this reduces the maximum capacity for heating, so the water is bypassed by hand as soon as the thermometer located in the boiler room indicates that the rheostat is handling too great a flow.

An idea of the saving in coal obtained through this use of surplus power is to be gained from the following table, which gives an estimate of monthly consumption from November, 1919, to May, 1920.

RECORD OF 3-PHASE, 2300-VOLT WATER RHEOSTAT USED AS A FEED WATER HEATER AT PLANT OF SPOKANE CENTRAL HEATING COMPANY, SPOKANE, WASHINGTON

Month	Kw-hr.	Avg. Kw. Load	Tons Coal Burned	Approx. Tons Saved by Rheostat	Kw-hr. per Ton Burned
Nov., 1919	2,217,240	3080	3830.75	500	579
Dec., 1919	*1,899,600	*2550	5438.63	*400	350
Jan., 1920	2,651,640	3565	4742.05	550	560
Feb., 1920	2,215,260	3180	3737.49	460	594
Mar., 1920	1,941,420	2610	3553.79	426	546
Apr., 1920	1,692,915	2350	3042.	371	557
May, 1920	1,087,500	1460	2073.84	228	524
Total,	13,705,575		26,418.55	2935	

*December values low due to interruptions caused principally by lime deposited in the discharge pipe by boiling of the water.

Average discharge temperature.....200-204° F.
Average intake temperature..... 52° F.

The smaller 8-inch electrodes (designed to carry a load of 2,000 kw.) are used in the summer time. The summer requirement, of course, is very light, a fact which fits in well with the low water periods for the hydraulic plants. Indeed, the only time when overlapping of the heavy heating load and a possible water shortage would occur, would be during the fall and winter months of a very dry year. In that case, the rheostat would be shut down and the steam heater made use of. The installation was made to take advantage of a condition of surplus power, and although it may therefore be regarded in some respects as temporary in nature, nevertheless, the condition of a winter surplus is one to be anticipated in many years and the advantages of thus utilizing waste power are so great that this may be counted upon as a regular part of the steam plant installation when the spare equipment and line capacity used are not required for the electric light and power service.

It is obvious that in general, it will not pay to purchase new transformers, build new lines or install increased hydroelectric generating equipment for this purpose. It is possible to heat feed water electrically in this manner only as a by-product of spare capacity.

Problem Course in Electricity

BY H. H. BLISS

(What relation has the size and kind of the wire in the heater to the amount of current it consumes? The following article, the twelfth of a series, takes up the question of wire sizes, and composition, and their weight and resistance. The author is on the staff of the Riverside Junior College at Riverside, California.—The Editor.)

ADDITIONAL WIRING PROBLEMS

Memorizing the Wire Table.—It is sometimes necessary to perform wiring calculations without a wire table, and for this purpose it is well to memorize a few facts and figures relating to wire sizes and resistance. One can readily figure out the characteristics of copper wire of any size in the B & S gage by remembering the data for wire No. 10 and the relation that exists between that wire and those larger and smaller.

Copper wire No. 10 has approximately 1 ohm per thousand feet, and weighs about 32 lbs. per thousand feet. Wires with higher gage numbers are smaller and have correspondingly larger resistances than No. 10. No. 13 has 2 ohms per 1000 ft., No. 16 has 4 ohms, No. 19 has 8 ohms, No. 22 has 16 ohms, etc., the resistance doubling for every third size. Wires with numbers below 10 have smaller resistance: No. 7 has ½ ohm, No. 4 has ¼ ohm, No. 1, ⅛ ohm, etc.

The weight of wire varies in the opposite way: No. 7 weighs 64 lbs. per 1000 ft., No. 4, 128 lbs., etc., and No. 13 weighs 16 lbs., No. 16, 8 lbs., etc.

To get more rapidly the data for very large or very small wires, one may remember that the characteristics change by the factor 10 for every tenth size. Thus No. 20 has 10 times the resistance and 1/10 the weight of No. 10; No. 30 has 100 ohms and 32/100 lbs. per 1000 ft.

Intermediate Sizes.—Should it be desired to obtain the characteristics of sizes other than those mentioned above, one need only remember two other factors, 1.26 and 1.59. The resistance of a wire is 1.26 times that of the wire next larger, and its weight is 1/1.26 of that of the wire next larger. Thus, the figures for No. 16 copper having been determined as above, we get those for No. 17: The resistance per 1000 ft. is $4 \times 1.26 = 5.04$ ohms; the weight is $8/1.26 = 6.35$ lbs. For No. 18 one may either use the factor 1.26 again or take the characteristics of No. 16 and the factor 1.59: $4 \times 1.59 = 6.36$ ohms; $8/1.59 = 5.0$ lbs. The same methods of course apply to wires larger than No. 10.

It must be recognized that the figures obtained by these methods are only approximate. They are often, however, sufficiently accurate to be of practical use. The chief things to remember are that No. 10 has 1 ohm and 32 lbs., and that the figures double for every third size. These make possible a quick rough estimate useful on many occasions.

Aluminum Wires.—In the table given with the first of the lessons on wire calculations (see Journal of Electricity for December 1, page 530) are found the characteristics of aluminum as well as copper wires. Computation with these figures is, of course, performed in the same way as for copper wire. If one lacks an aluminum wire table, the figures may be obtained from those for copper wire as follows: Any aluminum wire has resistance approximately equal to that of copper wire two sizes smaller and weight approximately equal to that of copper wire five sizes smaller. Thus No. 8 aluminum has 1 ohm per 1000 ft., corresponding to copper No. 10, and No. 5 aluminum weighs nearly 32 lbs. per 1000 ft., as does copper No. 10.

Stranded Wires and Cables.—For many purposes wires must be flexible enough to stand many bendings without breaking. A single copper wire is too weak and too rigid for this use, and hence there are made numerous forms of stranded wire, cables and cords. These contain from 3 to several hundreds of strands or filaments of wire, the larger numbers making the conductor very strong and flexible, though correspondingly more expensive.

In larger sizes such conductors are known as cables. The stranding increases the strength and reliability of such conductors, as well as making them easier to handle.

The section area and weight of stranded wires are found by multiplying the figures for a single strand by the number of strands; the resistance is readily calculated from the fact that all the filaments are in parallel and hence the resistance of one is divided by the number of strands to find that of the whole conductor.

To what size solid wire is a cable made of 27 No. 24 wires equivalent? The C. M. $= 27 \times 404 =$ 10,908, which the table shows to be just a little larger than **No. 10 wire** (10380).

How many No. 28 wires must be used to make a flexible cord of the same conductivity as a No. 6 wire? Divide the C. M. of No. 6 by the C. M. of No. 28: 26,250/160 = 164. Hence we must have **164 No. 28 wires.**

Iron and Steel Conductors.—For telephone lines in farming, mining and forest districts iron and steel wires are somewhat used. There are a number of grades, differing in conductivity and strength, the strongest steel wire being the least satisfactory from the standpoint of resistance. To protect the metal from oxidation it is always galvanized.

Steel cables are used to support trolley wires, telephone cables and other conductors. In certain

I HEREBY RESOLVE

(a) to press forward

(b) not to press the button when somebody has already rung for the elevator

JANUARY 1, 1921

cases of very long spans, where transmission lines cross rivers and canyons, the entire current flows through galvanized steel cables. Copper has not the mechanical strength to hold up its own weight over such long spans.

Example: A cable ⅜-inch in diameter, made of 7 strands of high strength crucible steel, weighs approximately 295 lbs. per 1000 ft. and breaks under a load of 11,500 lbs. Calculate the actual cross section area from the fact that steel weighs 490 lbs. per cubic foot; then find the resistance per mile, the ohms per circular mil foot being 115. The volume of 1000 ft. = 295/490 = .602 cu. ft., and hence the cross section = .602/1000 = .000602 sq. ft. This equals .000602 × 144, or .0867 sq. in., which equals 86,700 sq. mils and 86,700/.785, or **110,300 C. M.** Resistance per mile = 115 × 5,280/110,300 = **5.5 ohms.**

Resistant Materials.—There are many uses for wires and other conductors which carry currents but offer greater resistance than copper, aluminum or steel. A large number of different alloys have been invented for this purpose, each containing two or more of the following metals: iron, nickel, chromium, copper, zinc, tin, etc. They are upon the market under trade names such as Nichrome, Calorite, German Silver, Chromel, Climax, etc. They vary widely in resistance, mechanical strength and durability, the most expensive being those which can for long periods withstand the tendency of the air to oxidize highly heated metal. Cheaper alloys serve where they can be worked at low temperatures, as in resistance coils and rheostats.

A piece of nameless resistance wire supplied by a charging station was tested by the voltmeter-ammeter method with the following results: Wire No. 15, 10 feet long, current = 2.8 amperes, volts drop in wire = 45. The resistance per foot =1/10 of 45/28 = .16 ohm. Copper of the same size has .003179 ohm per foot, and hence this material has .16/.003179 = 50 times as much resistance as copper.

The same wire weighed .0885 lb., or .00885 lb. per foot. Comparing with No. 15 copper, which weighs .00986 lb. per foot, we find this resistance wire to be .00885/.00986 or .9 as heavy as copper.

Knowing from a simple test of this kind that this wire has 50 times the resistance and 9/10 the weight of copper, one can carry out with a copper wire table any necessary computations for making use of this material in any size.

Resistance Wire Tables.—The following figures from the manufacturer of a nickel-chromium-iron alloy are typical of the data which may be obtained regarding most of the resistance materials on the market.

B & S Gage No.	Ohms per Foot	Feet per Lb.	Price per Lb.	Amps. for 600° F.	Amps. for 1200° F.
10	.063	34.8	$ 5.56	24.0	35.6
12	.100	55.2	5.72	18.2	25.9
14	.160	88.4	5.88	12.6	18.4
16	.252	139	6.16	8.8	13.0
18	.409	226	6.60	5.7	12.0
20	.640	354	7.40	4.3	8.8
22	1.01	566	8.20	3.3	6.5
24	1.61	896	9.00	2.4	4.7
28	4.03	2280	11.20	1.3	2.4
32	9.98	5655	14.00	.75	1.4
36	25.6	14470	21.20	.43	.78
40	71.2	40200	39.00	.28	.45

The columns headed "Amps. for 600° F.," etc., indicate the current necessary to heat a straight piece of the wire in air to the indicated temperature. The resistance of this alloy at 600° F. is about 1.06, at 1200° about 1.12, and at 1800° about 1.18 times the resistance given in the table, which shows that the rise of resistance with heating is far less than with copper or aluminum wires. Most pure metals increase in resistance about 2/10 of one per cent for each degree Fahr. in rise in temperature, while this alloy increases only 1/100 of one per cent.

Solutions of Previous Problems

122. Safe size from table is No. 2. Weight is 350 × .2009 = **70.3 lbs.** Resistance = 350 × .000156 = .0546 ohm; drop = .0546 × 85 = **4.64 volts.** This drop would be considered high for a 110-volt circuit; it would be better to use No. 1 or No. 0 wire.

123. 70 × .00309 = .2163 lbs. Then .30/.2163 = **$1.39 per pound.**

124. The right end of each electromagnet must be a N pole, hence the current flows **"out"** at the top of each.

125. 66370/200.9 = 330, hence we need **330,000 ft.** of No. 2. For No. 20, 1022/3.09 = 331; for No. 36, 25/.076 = 329. Hence approximately **330,000 feet** of any size copper wire has a weight numerically equal to its C. M.

126. The answer is **copper wire No. 1.** Resistance = .099 ohm. Drop = .297 volt. At no load the motor voltage = **114.7.**

127. At 600 volts, amperes = 42000/600 = 70. Resistance = 3000/(70 × 70) = .612 ohms, or .612/12 = .051 ohms per 1000 feet. Select No. 0000, of which the weight = 12 × 640.5 = **7700 lbs.** At 2400 volts, amperes = 17.5; resistance = 3000/(17.5 × 17.5) = 9.8 ohms, or .816 per 1000 ft. Select No. 9 wire, weighing 12 × 39.63 = **476 lbs.** Note that the copper needed is only 476/7700 or 1/16 as much when the voltage is raised to four times its former figure.

128. Drop in 2 wires = 2 × .125 × 20 = 5 volts. 232 — 5 = 227 volts across 2 lamps in series when all are on. 227/2 = **113.5 volts.** When total current goes through neutral, 116 — 5 = **111 volts.** This shows the need of careful balancing of the load.

129. One C. M. = .785 of 1 sq. mil; 1 sq. in. = 1,000,000 sq. mils = 1,000,000/.785 or 1,273,000 C. M. Hence the area of No. 5 wire = 33,100/1,273,000 or .026 sq. in. A piece 1000 ft. long contains 12,000 × .026 = 312 cu. in. and weighs 100.2 lbs. One cu. ft., 1728 cu. in., weighs 100.2 × 1728/312 = **555 lbs.**

130. Current = 80 amperes; resistance cannot exceed 3/80 = .0374 ohms in 140 ft. of wire or .000268 ohms per ft. Select **No. 4** wire. This is **safe** if the insulation is weatherproof, not if it is rubber.

131. Full load current in outer wires = 5000/240 = 20.8 amperes. Drop limited to 3 × 2.40 = 7.2 volts; 7.2/20.8 = .346 ohms for 2600 ft. of wire, or .346/2.6 = .133 per 1000 ft. Select No. 1 wire. Weight of 3900 ft. of wire = 3.9 × 253.3 = 987 lbs., costing **$296.00.**

132. Line resistance = 2 × 1.300 × .1237 = .322 ohms. Total resistance = 15.322; current = 247/15.322 = 16.1 amperes. Volts across 6 ohms = **96.7**; across 9 ohms = **145**; drop in line = .322 × 16.1 = **5.2 volts.**

133. Length of wire is 1600 feet; the CM = 1600; the ohms = 1600 × 10.7/1600 = 10.7 ohms. The current = 12000/2400 = 5 amperes; hence the voltage = 5 × 10.7 = **53.5 volts.**

134. Input to motor = 1.80 kw. Output from generator = 18.9/10 = 1.89 kw. Loss in line = 1890 — 1800 = 90 watts, = amperes × amperes × ohms. Here ohms = .4, hence amperes × amperes = 90/.4 = 225; sq. root of 225 = **15 amperes.** The input to the motor being 1800 watts, the voltage = 1800/15 = **120 volts.**

New Problems

135. Without using a wire table, find the resistance and weight of 1000 ft. of No. 32 copper wire.

136. No. 10 (B & S gage) is about 1/10-inch in diameter. Find the C. M. of No. 10, No. 4, No. 30 and No. 33 without referring to a wire table.

137. What weight of bare copper will be necessary to carry 40 amperes to a load 750 ft. from the generator with a drop not over 10 volts? Solve without a wire table.

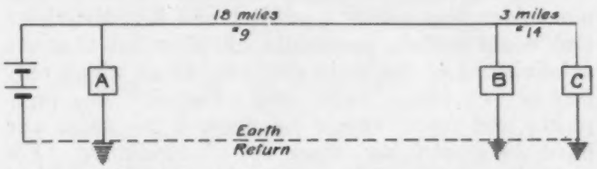


Fig. A.—A single wire telephone system such as is used in the mountains of the West. The No. 9 iron wire has 15 ohms per mile, and the No. 14 has 48 ohms. Each station has 150 ohms of resistance when the receiver is unhooked; the circuit is assumed to be open at any station with the receiver hooked. (See problem 143.)

138. Find from the memory scheme the resistance, weight and C. M. area of aluminum wire No. 18.

139. A cable of 127 wires has approximately the same resistance as one No. 7 wire. What is the size of the wires in the cable?

140. How many wires of No. 26 copper are required to make a stranded conductor of 19,050 C. M., and what is its resistance per hundred ft.?

141. A 1,750,000 C. M. cable is made of 91 copper wires. Find the diameter of the individual wires and the weight of the cable per 1000 ft.

142. The "tensile strength" of a material is the number of pounds required to pull in two a bar of it which has a cross section area of one square inch. Find the tensile strength of the metal in the ⅜-inch steel cable discussed above under "Iron and Steel Conductors."

143. Assuming that the resistance of the earth return in Fig. A is 5 ohms per mile, find the resistance of the entire circuit outside of Station A when someone at A talks to someone at C, the receiver being hooked up at B.

144. What current flows from the 3-volt battery at A when all three receivers are down? (Assume that no other batteries are operative.)

145. What is the cross section area of a steel cable weighing 125 lbs. per 1000 ft.? (Answer in sq. in. and C. M.) What would be the diameter of a single steel wire of the same section area, and what pull would break it?

146. A galvanized iron wire of .22 in. diameter has .153 ohm per 100 ft. Find the ohms per C. M. foot.

147. A nichrome heater consumes 600 watts when 5.3 amperes flow through it. Find the circuit voltage, resistance of heater, and size of wire (length = 9.58 ft.). The resistance of the nichrome at this temperature (1600° F.) is 69 times as great as that of copper at 68° F.

148. With the resistance wire for which the characteristics were tabulated, what size should be used if a piece 14 ft. long must produce a drop of 53 volts when 15 amperes flow?

149. What would be the list price of sufficient of the tabulated resistance wire to absorb 364 watts at 110 volts, the temperature being limited to 600° F.?

Pamphlets and Clippings in a Business Library

BY VIRGINIA FAIRFAX

(Odd items of information that come in clippings or pamphlets are often more valuable than material contained in bound volumes. The introduction of minute system into the business library, as described here by the librarian for the Carnation Milk Products Company, makes it possible to locate any item at a moment's notice. This is the sixth article of a copyright series.—The Editor.)

HOW INFORMATION IS CLASSIFIED AND INDEXED — Part 2

Marking of Material —

The title of a pamphlet or an article does not always indicate its precise subject, especially newspaper and magazine articles where a catchy title has been used to attract attention; but if the subject heading that is chosen does appear in the title, underscore it with a colored crayon pencil. The pamphlets and clippings, however, must have some other definite mark of subject identification both for convenience in filing and re-filing and to facilitate charging out of borrowed material. Cutter numbers assigned from the subject headings are better for this purpose than writing the subject headings, which sometimes are long, in full across the tops of the pamphlets. A colored crayon pencil may be used for this in preference to ink, which generally blurs on soft paper, and the Cutter number should be placed in the upper right hand corner of the pamphlet.

Cutter Numbers —

There are on the market three Cutter tables that may be purchased from the Library Bureau: the Cutter two-figure alphabetic-order table; the three-figure table, which is an enlargement of the two-figure table; and the Cutter-Sanborn three-figure alphabetic-order table. These three tables were designed for keeping books of a class in alphabetic order on library shelves according to the author's surname. By means of the initial letter of the surname combined with certain numbers, an alphabetic and numeric sequence is provided. Consequently since these tables were designed for surnames rather than for subjects, and are the best to be had until someone works out a Cutter table for subjects, care must be exercised in the selection of the numbers and the building up of numbers for subdivisions of a subject. For example, the word "petroleum," in strict accordance with the rules of the Cutter three-figure table, would be assigned P449, which leaves no extra numbers within that numeric division for expanding the subject. Therefore, by moving the word "petroleum" up to the beginning of the 44 division, namely Pet44, the following expansion may be worked out.

Petroleum —	P44
" — Distillation	P44D
" — Laws & regulations	P44Lr
" — Measurements	P44M
" — Transportation	P44T
Petroleum as fuel —	P441
Petroleum industry —	P442
Petroleum sampling —	P448

I HEREBY RESOLVE

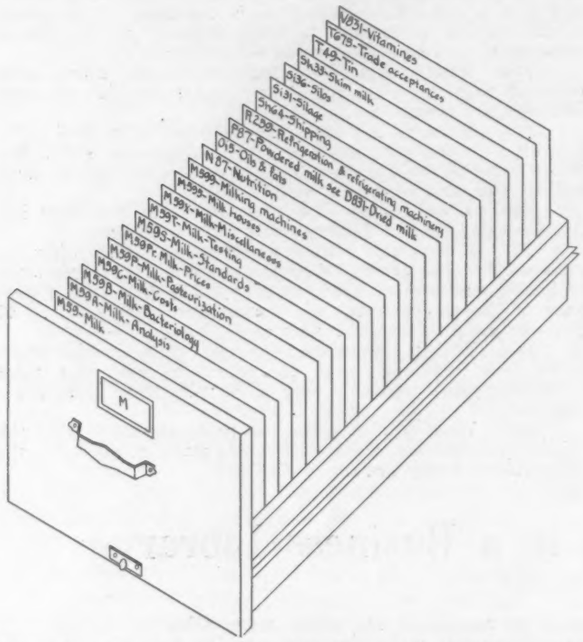
(a) to give full measure of service

(b) not to give an after dinner speech more than two hours in length

JANUARY 1, 1921

This assignment leaves the numbers between 2 and 8 for insertion of other subdivisions of the subject "Petroleum" when need arises.

This general principle of moving a subject that will need expansion from its proper assigned Cutter number up to the head of its numeric division may



Information file made up with straight edge pressboard folders without guides. Illustrates alphabetic arrangement of subjects with Cutter numbers.

be followed with safety because the alphabetic combinations in subject names do not occur in as close sequence as do the alphabetic combinations in proper names.

It should be emphasized at this point that the assignment of Cutter numbers should not be attempted by a novice; it should be done only by an experienced librarian.

The main consideration in assigning Cutter numbers is to anticipate the probable expansion of the subject and allow sufficient numbers. For example, in the Industrial Arts Index the subject Automobiles and its allied subjects make an extensive list, and a business library interested specially in this subject would need to allow for a greater expansion than libraries interested only incidentally in automobiles. After the number for the subject has been selected the folder is marked with the Cutter number followed by the subject heading and this marking is placed on the upper left hand margin of a straight edge folder or on the tab of tab folders.

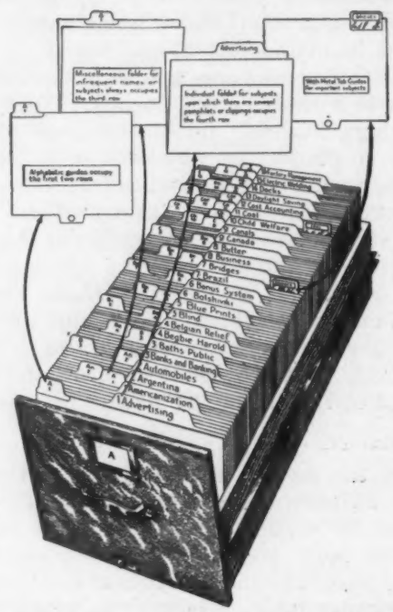
Either of the three figure tables are recommended. If the collection is small two figures only need be used, but it is advisable to have the three figures for expansion and growth.

Miscellaneous Folders —

In any collection of pamphlets and clippings there will be on some subjects but one or two articles, not enough to warrant an individual folder. Filing space is too valuable to fill it with folders holding only a pamphlet or two, therefore there may be used what in correspondence filing systems are called "miscellaneous folders." However, too strong emphasis cannot be laid upon the warning to use miscellaneous folders with great discretion.

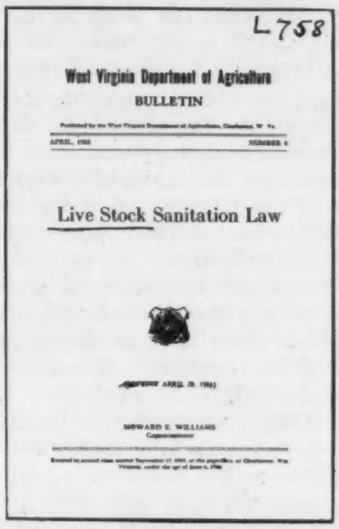
There are two methods of using miscellaneous folders depending on the amount of material or extent of the files. In a small collection a miscellaneous folder may follow a subject and its subdivision and would contain pamphlets and clippings that are subdivisions of the main subject, but on which only one or two pieces have been collected. The pamphlets and folder should be marked the same and have an identifying mark for "miscellany." For example, M59Z — Milk — Miscellaneous, is marked on the folder in red, or in any distinguishing color, and the pamphlet is marked M59X, with the crayon pencil used on all pamphlets. When the collection of material on any one of the several subjects that have been filed in this miscellaneous folder grows sufficient to warrant an individual folder, that material is removed, the mark on the pamphlet is changed and the material filed in an individual folder appropriately marked. For example, the library may have one pamphlet to which has been assigned the subject Milk — Laws. This has been filed in the miscellaneous folder and marked M59X. When more material on this subject is gathered, remove it from the miscellaneous folder, rub out the X, substitute an "L" and file it in a folder marked M59L — Milk — Laws.

In this same small collection, besides having a miscellaneous folder following a subject and its subdivisions, there also may be used a general miscellaneous folder filed in its alphabetical place and assigned a Cutter number from word "miscellaneous" M681 — Miscellaneous printed in red or any other distinguishing color, or on a different colored



Illustrates a Library Bureau set-up. Information file made up with tab folders and guides and miscellaneous folders. If the method of using Cutter numbers as explained in the text is adopted they would be substituted for the numerals shown on these folders.

gummed label. In this folder may be dropped pamphlets and clippings on subjects that are not expected to grow and are of a general nature.


L758

West Virginia Department of Agriculture

BULLETIN

Live Stock Sanitation Law

Illustrates marking of pamphlets, with the subject heading in the title underscored. Note the position of the Cutter number.

The second method is used in information files made up with guides and tab folders. The miscellaneous folders with tab in the third position marked similarly to each guide but in a different color are filed after the subject folders and just in front of the next guide, as shown in the illustration. These miscellaneous folders will hold pamphlets and clippings on subjects that if given individual folders would be filed between these guides. For example, the first guide is marked "A," printed in black, as are all guides, the miscellaneous folder is marked "A," printed in red, as are all miscellaneous folders in this set up, the second guide is marked "An." Following the guide "A" have been filed individual subject folders marked Ac25—Accidents; Ad96—Advertising; Am35—Americanization. There is one pamphlet on Alfalfa which is marked A128X and filed in the miscellaneous folder "A" which stands behind the last subject folder, in this case, Am35—Americanization. and just in front of the next guide marked "An." When the collection of material on the subject alfalfa has increased, remove the pamphlets so marked, rub out the X and place them in folder marked A128—Alfalfa, and file in alphabetical place.

The Possibilities of the Convenience Outlet Campaign

BY GARNETT YOUNG

(The promotion of the convenience outlet idea has been one of the most important pieces of work in which the different branches of the industry have been brought together. The part which has been, and may be played by the California Cooperative Campaign in this activity is here discussed from the manufacturer's standpoint by the president of Garnett Young & Company.—The Editor.)

For the purpose of obtaining a summarized estimate of the California Electrical Cooperative Campaign from the standpoint of the manufacturer, an investigation was carried out on the Pacific Coast to ascertain which particular plan of the Campaign activities made the strongest appeal for each manufacturers's endorsement and support.

To facilitate an orderly presentation of the subject, this paper will deal separately and successively with four different phases of the Campaign's work, but this arrangement of subtitles should not be taken as a rating or ranking of the relative importance in the manufacturer's view.

First: The manufacturers commend the California Electrical Cooperative Campaign for the spirit of cooperation established between the several branches of our industry, engendering broad-gauged sympathy and interest on the part of each branch in the needs and responsibilities of the other branch. This means teamwork with selfishness eliminated. The manufacturers feel that a battlefront of this sort is invincible. The Campaign started with clean hands and a one hundred per cent right to indulge a clear conscience, and its record to date shows no back-sliding. Our 'get-together' occasions and the evidence of unquestioned success furnish every inspiration to hold the Campaign managers to right thinking and paths of endeavor. Verily we believe that if any manufacturing group or faction ever undertook to use this Campaign selfishly, that is, appropriate advantages not available to the rest, the indignant remainder would stand the offenders on their heads.

Second: The manufacturers commend the help given to electrical dealers by the introduction of a standard accounting system and improved sales methods, the latter involving changing the premises from the former status of a hole-in-the-wall to an up-to-date store, with stock, solicitors, display rooms and windows, and backed by newspaper publicity and the local central station manager. In other words, the electrical dealer has been made over into a business man, now able to make money for himself; a safe risk for his creditors, and fit in every particular to work out his role as the point of contact between the industry and the public. This last is vital because the best service which the manufacturers, jobbers and central stations can give will still fall short of the ultimate required service to the public; the electrical dealer is depended upon to complete this service. Nothing is truer than that an industry cannot advance faster than its service to the public nor does it deserve to.

Third: The manufacturers recognize that the aforementioned methods adopted by the dealers is responsible in a very great measure for the wonderful increase in the sales of heating devices and appliances in this state. Of course, the domestic labor problem, with its acute interest to the householder made the time opportune for a drive of this sort, but be that as it may, we must admit that the opening was seen and taken advantage of by our Cooperative Campaign. And the result was business for the dealer, business for the jobber, business for a particular group of manufacturers and, lastly increased day-load for the central station.

Fourth: We now come to that particular phase of the work which happens to be the latest on which the campaign embarked and which appears, on the face of the returns, to have endorsement from a greater number of manufacturers than accorded to any activity. This relates to the recently inaugurated drive for the complete wiring of homes and particularly that angle of the drive dealing with convenience outlets. Representatives of fourteen different man-

I HEREBY RESOLVE

(a) to advance the cooperative movement

(b) not to advance more than one week's salary to the cook—she may not stay that long

JANUARY 1, 1921

ufacturers, all contributors to the campaign, expressed themselves as pleased with the start just made, successful at the very outset, and enthusiastic over the greater possibilities which lie ahead in this direction.

This attitude of the majority of the manufacturers would seem to justify dwelling on this phase, and with the conviction that the Campaign management welcomes constructive criticism from its constituents, I shall suggest in some detail, the possibilities, as we see them, for the development of more extensive wiring installations in living quarters.

We will first state our objective and follow with suggestions as to the available avenues of approach.

The manufacturers want, commencing now and with rapidly increasing effectiveness, to encourage the complete wiring of all new homes to be built in California of which the number required and likely to be constructed is estimated by the California Housing Commission at one hundred and thirty thousand.

We want, beginning immediately, to reach the owners of all old homes (whether the owners happen to be landlord or actual occupants), and induce them, in cases where the premises are not already wired, to get busy with a complete installation; and, where the premises are insufficiently wired, induce them to install extension outlets. The Housing Commission's figure on the number of old homes in this state is six hundred and fifty thousand. Permit us to present some calculations as to business lost by the contractors on old homes and business which may be had from homes yet in prospect if the game is worked right. All these figures deal with convenience outlets only and eliminate outlets for illumination.

OLD HOMES

Old homes in California	650,000
Average number of convenience outlets, 1 at cost of $2.00	$ 1,300,000
Convenience outlets required under plan, or 20 at $2.00	26,000,000
Business lost by not planning for convenience outlets	24,700,000

NEW HOMES

Number of new homes required in State	130,000
20 outlets at $5.00 each	$13,000,000
Less old average of 1 outlet at $5.00 each	650,000
Possible additional business to contractors under convenience outlet plan	12,350,000

Surely the story told by these figures as to business already lost should sufficiently jar the contractors and the rest of us into unified action. Do we hear someone comment that all this sounds fine for the contractor, jobber and the manufacturer of wire, conduits and schedule material, but how do we know that all of these outlets, if installed, would be utilized in service, and if not, where does the manufacturer of heating devices and other appliances profit, and where is the central station assured of any increased load? Well, we have the authority of the Society for Electrical Development for the following percentages: In homes not equipped with convenience outlets, appliances lying idle on shelves—60 per cent; homes provided with convenience outlets, appliances in actual use—97 per cent.

Going further with local estimates in combination with Housing Commission figures, we come up against the following showing on appliance sales:

Average value of appliances in homes	$ 150
Possible value when the electrical idea is instilled	750
650,000 homes at $150, or value appliances in old homes	97,500,000
650,000 homes at $750 possible with 20 convenience outlets each	487,500,000
130,000 homes at $150 value appliances in new homes if only 1 outlet	19,500,000
130,000 at $750 possible with 20 convenience outlets	97,000,000

Is the game big enough to have our attention? Does it hold out promise of stupendous business for each branch of the industry? If you think the estimates are crazy, then cut them in half. Is the remainder still worth while? Shall we be content to realize that this field is here, and still not exploit it by other than the meager methods employed in the past? If these figures are worth anything at all they demonstrate that the possibilities for our industry by exploiting the **complete wiring** of homes utterly dwarf the possibilities to be expected from any other kind of drive. Why play with dimes when we can deal with dollars?

Why be content with the old system of introducing devices and appliances into homes not wired to accommodate them, thus handicapping the service rendered with the tendency ultimately to dissatisfy the user and consign the appliances to shelves or attic? Heretofore, we have put the cart before the horse. We have been selling appliances without considering outlets or the consumer's permanent interest. If we are wise we will stop promoting the connection of these articles to lamp sockets, current taps, plug clusters, or other double duty devices, for they are all compromises and stand in the way of our real objective, i. e., complete and convenient service, which means permanently satisfied users. Our slogan should be, "An Outlet for Every Appliance."

We manufacturers have the greatest respect for the potentialities of the Cooperative Campaign and believe it can accomplish whatever it undertakes within reason. Therefore, our only concern is that its energies and resources be applied to such movements as promise the biggest returns. We recommend that the problem, which is, after all, to educate the public to the electrical idea, be attacked through all the different available channels of influence. The outstanding mediums are architects, building contractors, building investors, newspapers, contractor-dealers, manufacturers and others who indulge in popular advertising.

Architects

The electrical idea can be sold to the architects if you keep in mind their viewpoint. But when you ask them to take money from their clients and transfer it to our pockets by specifying a liberal wiring installation in homes they design, you must give them a justifiable reason. There is only one sound reason for asking any professional man to spend his client's money, and that is, to serve his client's interest thereby. The Campaign can demonstrate that the client gets value received on an original complete electrical installation; and more, that no householder can afford to be without electricity's aids and comforts. Talk "convenience outlets" to the architect and evidence the economy to his clients by having these outlets installed as a part of the original work rather than later as an extra at disproportionate cost. One architect convinced may mean scores of future homes properly wired. People who build homes pay for an architect's advice and are likely to follow it, hence we need every architect as a booster for the "convenience outlet."

It is believed that educational work among architects will take hold quicker and make a more lasting impression when the architects understand that the appeal comes from a united industry, designed to cooperate with that profession, in the interest of its client rather than from the individual manufacturers with respective axes to grind. The Cooperative Campaign should continually capitalize this inherent characteristic.

Building Contractors

The electrical idea can be sold to the building contractor (where no architect is involved) by keeping in mind his viewpoint. Generally, he is quite willing for the owner to spend all the money he may wish on the electrical and other features of the home. With the proper convictions, this contractor might be inclined to promote complete electrical installations, rather than the other kind. Some building contractors operate on a big scale in residential construction.

Building Investors

These men put their money into new homes on a commercial plan, building houses for resale, and flats, apartments, etc., for lease. What they want above everything else is salability and, by keeping this viewpoint in mind, it is a cinch to win them over to the electrical idea. A house or an apartment with a modern electrical installation has a big edge on its appeal to the housewife. The present local experiment on the "Home Electrical," through cooperation with a certain building investor, promises and will get far-reaching results if the advertising puts emphasis on the "convenience outlet" rather than on the appliances displayed. Moreover, the advertising of this stunt should be directed towards getting not only the public, but architects and builders, to make an inspection. One building investor, thoroughly imbued with the electrical idea, might answer for a hundred or more electrical homes.

Contractor-Dealers

Notwithstanding all the coaching these retailers of the industry have received, many of them still have only one eye open. Many contractors do not try to influence the architect or owner to a more extensive electrical layout in homes, but appear only concerned with out-figuring competitors and landing the job. Moreover, when selling appliances from the store, the dealers do not make the proper inquiry as to the outlets to accommodate them. They are perfectly willing to let the purchaser pack off the heater, or the vacuum cleaner, or whatever it may be, and connect it to lamp socket. The dealer has but to talk the extension outlet and insist that the householder let him come out to the premises to see what is needed. As a matter of fact, the contractor-dealers ought to anticipate this sort of business and persistently advertise, both by newspapers and show-window display, the facility and economy of the extension outlet, thus building up a wiring business coincident to the development of appliance sales.

Take a look at any of the electrical pages in our newspapers, appearing under the auspices of the Campaign, and you will find heavy appliances offered by various stores, but never a word about an extension outlet. Sometimes these ads blandly state that the appliances can be connected to any lamp sockets. That is wrong. The Campaign should see to it that these ads illustrate the appliances plugged into a convenience outlet.

Contractors should establish their respective individual bogies of responsibilities toward reducing the electrical wiring loss estimated in old and new homes at $36,000,000.00 and with programmed purpose devote their constant daily efforts to increasing the number of "convenience outlets." It was possible for ancient Rome to become the cleanest city in the world only through each Roman keeping his own yard clean. The same individual responsibility is required here to secure the results we are after. There will always be a small percentage to drag an inert mass on any progressive program—don't let them waste time with "Wake-up brother" preaching but by overlapping effort let us try to clean their yard as well as our own.

Manufacturers

Many electrical manufacturers indulge in popular advertising in national magazines and every one of these should be brought into line by the Campaign to support the drive for the complete wiring of homes and particularly boost the idea of the "convenience outlet." This could be done without any extra cost to these manufacturers in connection with their individual copy. It is a shame to let such an opportunity be missed. Central stations doing local advertising come under this same category.

Finally, as we view it, the Cooperative Campaign has its most effective work yet ahead, and any talk of discontinuing, on the grounds of having fulfilled its original mission to the contractor-dealer, ought not to be listened to. True enough, a lot has been done for the dealer, but there is much yet to be done for the wiring contractor. In building up that end of the business we hope the foregoing suggestions may be helpful. Almost all the electrical manufacturers are oversold now and behind on production. This will not always be true, so here is the time to turn our attention from current orders to planning the future, and that means educational effort. The effect of all advertising and educational effort is cumulative. Remember the 130,000 homes coming along and no servants. Electricity, expressed in the "convenience outlet," is the answer. The manufacturer, therefore, earnestly recommends to all concerned that the good work still go on.

INDEX

The index to Volume 45 of the Journal of Electricity, July-December, 1920, will be ready at the end of this month, and will be mailed to subscribers upon application.

I HEREBY RESOLVE

(a) to keep my store windows attractive

(b) not to keep cider more than a few weeks—it is good enough after one

JANUARY 1, 1921

SPARKS—Current Facts, Figures and Fancy

(A new world's record for the West, the advance of the electric vehicle, the latest in high tension transmission development and some significant figures of high finance are presented on this page. The man who deals with an electric sign will be interested in a new method of multiplying light and those concerned with the development of the Orient will welcome a certain item from China which appears here.—The Editor.)

The West's appreciation of the water power act is shown by the fact that one-third of the country's bids for permits or licenses to the federal power commission are being made from California.

* * *

Sweden proudly states that she has a 200,000-volt line under construction, but the West can answer her with the 220,000-volt line which is to be built this year in connection with the Pit River project.

* * *

We have been told by the Geological Survey that the ocean contains about 302,000,000 cubic miles of water, but would be glad to receive any correction to the figure which a private investigator may care to offer.

* * *

A powerful wireless station is to be erected in Hongkong for the purpose of communicating with India, Honolulu and other Oriental stations. In a few years, it seems, there will not be an out-of-the-way place on earth.

* * *

Spain has developed 620,000 hp. up to date as compared with 281,480 hp. in 1914. Even this increase has made little impression upon the potential water power of the company, only 10 per cent of which is now being used.

* * *

A new world's record was made in San Francisco at the close of the recent Pacific Coast Radio convention when a wireless operator, Gearhardt, took forty-nine and one-fourth words per minute for four consecutive minutes without error.

* * *

The past year has been a record one as far as corporation financing is concerned. During the first eleven months of 1920 this type of financing exceeded $3,050,000,000. This total, which was utterly unprecedented, included $2,224,000,000 borrowed by industrial corporations.

* * *

The fewer the poles the more pleasing the landscape, and so the crane trolley wires and local lighting circuits and lamps are being carried on the same concrete poles in an Eastern transformer tank yard. The wires are carried on insulators fastened to bow-shaped strap-iron holders.

* * *

The engineer has always been considered the most essential part of railroad operation, yet England reports that a special committee has been appointed to consider the possibilities of automatic railway train control. Judging from recent experiments this development is not improbable.

A significant compliment to the power companies is the fact that very little of the huge public utility debt on which interest has been defaulted is in electric light and power securities. Of a total $500,000,000 principal in default only $9,102,000 is in bonds of purely electric light and power companies.

* * *

The largest single generating and distribution system in the world is that of the Ontario Hydro-electric Power Commission. Since the recent acquisition of the MacKenzie power interests in the Toronto and Canadian Niagara district the total capacity of plants now owned and under construction is more than 1,000,000 hp.

* * *

Electricity has been found especially useful in connection with the road-paving work now being done between Salt Lake City and Ogden, Utah. Contractors have concluded that electric power is more practical and economical for pumping purposes and for the operations of rock crushers, elevating machinery and mixing plants.

* * *

The multiplication of light through the use of mirrors and lenses is the latest innovation in the electric display sign world. A centrally located incandescent bulb is reflected by mirrors behind a number of lenses which project the light so that in an ordinary sign the bulb is used to illuminate an entire letter. It is claimed that each lens is as bright in appearance as if an individual lamp were behind it.

* * *

Telephoning to Catalina is among the amusements and conveniences offered Southern California pleasure seekers. A wireless telephone service is being operated over the 27 miles between the mainland and this island. This service is connected with the system of the Pacific Telephone & Telegraph Company so that any subscriber can use it over his own telephone just as he would any other long distance call.

* * *

A skeptical attitude has been taken toward the every day use of the electric vehicle, nevertheless in New York last year a total of $22,750,000 was invested in electric trucks. Any question as to the speed and practicability of this type of trucking is settled by the recent record of a five-ton electric truck which made the 96.3-mile trip from Philadelphia to New York, maintaining an average speed of better than twelve miles an hour. The number of trucks sold up to November 1st represents an increase of 548 per cent over the number sold during 1919.

PERSONALS

R. L. Eltringham, formerly electrical engineer of the California Industrial Accident Commission, has resigned to take a position as manager-secretary of the California Electrical Cooperative Campaign. His new duties began on January 1, 1921. Mr. Eltringham has had an extended experience in electrical affairs. He operated one of the earliest electric lighting plants in Pennsylvania and held various positions with the pioneer lighting and street railways in the East. After a short experience with the Cramp Shipbuilding Company he was employed by the Baldwin Locomotive Company in their electrical department when the manufacture of electric mine locomotives was first undertaken in conjunction with the Westinghouse Electric & Manufacturing Company. He went West in 1901 and was employed by the Consumer's Gas Association of San Francisco, Cal., and later by the Pacific Mail Steamship Company on electrical work. From 1906 to 1907 he was employed by the Commonwealth Edison Company of Chicago and returned to California in 1908 to take charge of the electrical power work of the Empire Construction Company. Resigning that position in 1919 he became industrial power engineer of the Great Western Power Company of San Francisco, Cal., where he remained until, in 1914, he accepted the position of electrical engineer of the Accident Commission. Mr. Eltringham has been active in the formulation and administration of the various electrical safety regulations of that commission including the Utilization Safety Orders, the Mine Safety Orders and the Lighting Safety Orders.

Richard Chappell is the new local manager of the Eastern Oregon Light and Power Company at La Grande, Oregon. He is taking the place of R. F. Dean, who is planning to locate in western Oregon.

Max Lowenthal, president of the Globe Commercial Company of San Francisco, has returned from a two months' trip through the East and Northwest visiting the various factories represented by his company.

H. L. Cook, formerly sales manager with the Idaho Power Company has severed his relations with this company and is at present Northwest manager for the Hoover Suction Sweeper with headquarters in Portland.

E. H. Clausen, after holding many responsible positions in mines in the United States and the Philippine Islands, has returned to Berkeley to accept a position as heating and ventilating engineer with the H. W. Johns-Manville Company.

J. B. King, telephone specialist of the Western Electric Company, Seattle, attended the convention of managers of Oregon Telephone Companies held in Portland on December 17 and 18. The Portland branch of the Western Electric was represented by **S. B. Ward**, manager.

A. W. Leonard, president of the Puget Sound Power & Light Company, and **D. C. Barnes**, manager of the Seattle division of the same company, recently returned to Seattle following a trip of several weeks' duration throughout the East. A major portion of the time was spent in Boston, in the offices of the Stone & Webster Corporation.

Ralf R. Woolley, hydraulic engineer of the United States Geological Survey, addressed the Commercial Club of Salt Lake City recently, urging its members to support a number of feasible irrigation projects in Utah and neighboring states. He suggested the possibility of combining the power systems of Oregon, Washington, Idaho and British Columbia, which comprise a total of about 12,000 miles of transmission lines.

E. M. Herr, president of the Westinghouse Electric & Manufacturing Company, and **L. A. Osborn**, president of the Westinghouse Electric International Company have been decorated with the Order of the Rising Sun by the Emperor of Japan. These two American manufacturers have been in Japan for several months studying oriental industrial conditions with particular reference to developments in the electrical field.

Hugh L. Cooper, former Spokane engineer and now internationally known as a hydraulic engineer, has drawn up plans for the construction of five dams to produce 5,000,000 horsepower by harnessing the St. Lawrence river at a cost of $1,300,000,000. It is reported that the project is being considered by a joint American and Canadian commission. Mr. Cooper states that to make this development possible 300 tons of ice must be handled per minute and that it will be necessary to heat the masonry at the dams to prevent water freezing and stopping the flow. It will also be necessary to plan for transmitting the electricity 2,000 miles.

A. U. Brandt, who until recently held the position of electrical distribution in Alameda County with the Pacific Gas & Electric Company of California, has been promoted to the Position of electrical engineer of the San Francisco division of that company and will be in charge of the operation and maintenance of the electrical properties and steam generating stations in San Francisco. From 1899 until 1904 he was an inspector for the Independent Electric Light & Power Company of San Francisco, then that company was purchased by the San Francisco Gas & Electric Co., at which time he became an inspector of the California Gas & Elecric Company, of Oakland, Cal. Since the merger, in 1905, of the latter company into the present Pacific Gas & Electric Co., he has filled various successive positions leading up to that of superintendent.

E. T. Millham has been appointed field secretary of the recently organized Rocky Mountain Electrical Cooperative League, at Salt Lake City. The duties of the field secretary will principally consist of visiting central stations, jobbers and contractor-dealers in the various towns throughout the territory embraced by the league, to promote the objects of the organization, through educational methods, and to enlighten the public on the subject of the advantages of the use of electricity. Mr. Millham has had many years' experience in the electrical industry, first with the General Electric Company at Schenectady, and later with the Utah Power & Light Company, and the Hurley Machine Company, his headquarters being in Salt Lake City.

I HEREBY RESOLVE

(a) to advertise

(b) not to advertise the flivver before the trip—it is sure to stall

JANUARY 1, 1921

Frank R. Whittlesey, who was made secretary of the First District, Oregon Association of Electrical Contractors and Dealers, with headquarters in Portland, early last fall, spent a number of years as appliance salesman and three years in the commercial department of the Portland Railway, Light & Power Co. before becoming identified with the contractor-dealer association. His energetic work and pleasing personality have been the means of reviving and strengthening interest in the association and the programs and attendance of the bi-monthly meetings have shown a marked improvement since he took over the work. At present he is actively engaged in organizing branches in the six districts in the state outside of Portland, the first of these organization meetings being held in Salem on December 7. Mr. Whittlesey believes that the Northwest Electric Service League will have a far-reaching effect on the prosperity and development of the electrical industry in the Northwest and is arranging the affairs of the association to make its work more effective.

L. J. Pospisil, now secretary of the Spokane section of the A. I. E. E., is chief draughtsman for the Washington Water Power Company, in charge of mechanical and hydraulic design.

G. E. Watts, southern sales manager of the Locke Insulator Manufacturing Company, was elected vice-president of the Southeastern section of the N. E. L. A. at its recent convention in Miami, Fla.

S. L. Whiteside, general auditor of the General Electric Company since 1911, has been elected comptroller of the company to succeed **C. E. Patterson,** promoted to the vice-presidency in charge of accounting.

Frank Thornton, Jr., chief engineer of the Westinghouse Electric Products Company, has been appointed manager of the electric heating engineering department of the Westinghouse Electric & Manufacturing Company.

William H. Taylor has resigned as president and general manager of the Iron Age Publishing Company and has been succeeded by **Fritz J. Frank,** a publisher of long experience who has been with the company since 1910.

E. S. Carman, president of the A. S. M. E., will visit San Francisco the week beginning February 1, Los Angeles during the week beginning February 7, and the cities of the Northwest during the week beginning February 15.

Roy A. Weagant, consulting engineer of the Radio Corporation of America, has been awarded the Leibmann memorial prize for the best work of the year in progressive discovery tending toward the advancement of the radio art.

J. P. Lottridge, general manager of the Eastern Oregon Light and Power Company, has returned to Baker City, Ore., after an inspection of the La Grande branch of the company and the work of installing **Richard Chappell,** the new local manager there.

Markham Cheever, chief engineer of the Utah Power & Light Co., **W. R. Wallace** and **W. R. Armstrong** have been named by the Commercial Club of Salt Lake City as a permanent water power committee, to investigate and keep in touch with water power matters in the state of Utah, looking to the further development of those resources.

Frank C. Wight, associate editor of Engineering News-Record, is making a tour of the Western states for the purpose of studying engineering conditions. The first of a series of articles recording Mr. Wight's general impressions of this section of the country appears in the Dec. 9 issue of Engineering News-Record. Technical articles on outstanding Western developments will follow later.

N. C. Grover, chief hydraulic engineer of the United States Geological Survey, was a recent visitor in Salt Lake City while on a tour of the various district offices of the survey, for the purpose of meeting with local officials and engineers regarding work which has been done during the past year and that which is planned for 1921.

Page Golsan, formerly assistant to the president of the Great Western Power Company, San Francisco, and also consulting engineer for the western office of C. B. Peters Company, Inc., as well as the Fleishhacker interests, has resigned these positions to become associated with the engineering firm of Ford, Bacon & Davis, New York.

R. S. Daniels, the present chairman of the Spokane section of the A. I. E. E., is assistant engineer for the Washington Water Power Company. In 1906 he entered the employ of this company, shortly after graduating from the University of California. He has been electrical construction foreman on a number of important projects and recently has been assisting the chief engineer.

G. C. Heckman has been promoted to the position of superintendent of electrical distribution of the Southern California Edison Company. When Mr. Heckman graduated from Purdue in 1903 he became electrical mechanical engineer of the National Board of Fire Underwriters in New York City and gained an extensive experience in fire-fighting apparatus. From 1905 to 1908 he was employed by the General Electric Company as erector, when he went to the Hawaiian Islands and installed one of the first turbine driven dredges ever placed in operation. In 1909 he was employed by the Southern California Edison Company and since then has been in charge of the actual installation of all the electrical equipment in that company's new generating and substations.

Robert Sibley, editor of Journal of Electricity, has returned from a six weeks' visit in the East, during which time he acted as delegate from the San Francisco section of the A. S. M. E. to the first convention of the American Federated Engineering Societies which was held in Washington, D. C., November 18 and 19, and also to the annual meeting of the A. S. M. E. in New York City, December 8-10. Mr. Sibley spent some time visiting the New York offices of the McGraw-Hill Company, Inc., during which time he attended a centenary celebration dinner given by the Crocker-Wheeler Company in honor of Ampere at Ampere, New Jersey, on the 4th of December. Mr. Sibley also attended a dinner given in honor of Governor Coolidge at the Hotel Biltmore on December 4.

J. W. Mahoney, chief clerk of the order department of the General Electric Company, San Francisco, has recently been appointed secretary of the San Francisco Electrical Development League to take the place of **Robert D. Compton** of the Pacific Gas and Electric Company, who resigned. "Jim" Mahoney, as he is familiarly known, started his business career in Weaverville, Trinity county, California, as the court reporter of the superior court of that county. In 1906 he joined the General Electric Company offices as a stenographer and since that time has worked his way up until he has reached his present position. The selection of Mr. Mahoney for the position was made after the consideration of several other names and it was decided that he was better qualified and located to handle this important position.

Meeting Notices for Electrical Men

(One of the most important meetings ever held under the auspices of the San Francisco Electrical Development League is the one at which the question of public versus private ownership was discussed and which is reported in detail below. Among recent Inter-mountain meetings stands out one of the executive committee of the Western States Reclamation Association and from the Northwest comes a report of an interesting A. I. E. E. meeting as well as progress of the Northwest League.—The Editor.)

Public vs. Private Ownership Presented to San Francisco Development League

The necessity of creating favorable public sentiment regarding the power companies, to assure development programs, was brought out by Wigginton E. Creed, president of the Pacific Gas & Electric Company, at the regular meeting of the San Francisco Electrical Development League at the Palace Hotel on December 13. Mr. Creed spoke of the negative influences which are working against the private ownership of public utilities and stated that the agitation which was being brought up at this time was largely due to the fact that public utilities had been forced to raise their rates in the past two years in order to keep up with the rising costs of labor and materials. Mr. Creed traced the progress of the industries into politics, whether they wanted to go into politics or not. Then came state regulation, which has been adopted by practically all the states in the Union and which corrected the abuses which had cropped out under local regulation. The rates were put down and the man who was in favor of public ownership had no chance to make anyone listen to his propaganda. During the war the regulating bodies recognized the economic conditions and increased the rates of the utilities. None of the utilities asked for profit but merely asked for the cost of doing business. Increasing rates is not a popular proceeding and as a result the agitator and the municipal ownership theorist were again given a start and a move is under way to kill state regulation. These theorists and agitators recognize that the best way to kill private ownership of public utilities is to kill state regulation of them, for state regulation and private control must go together. It is basic principle that regulation and service must be coincident and that it is impossible to give statewide service under the varying demands of local regulation. At the meeting of the League of California Municipalities, on November 10, a resolution was adopted recommending that the state of California take over all public utilities and especially the power companies, and go ahead with the work of power development. Mr. Creed stated that in the state of California there were two and three-quarter billions of dollars invested in public utilities and of this amount six hundred million was invested in the power companies. In 1919 $29,000,000 were expended in new capital invested in the power companies, and the Pacific Gas & Electric Company and Southern California Edison Company have under way a construction program which means an expenditure of $1,000,000 per month for each company. This state has already an authorized bonded indebtedness of $101,000,000 and in the past nine years there has been an increase of 180 per cent in the cost of government. There is the need of expending $500,000,000 in the next ten years for power development in this state, and to saddle this on to the state, plus the additional financing involved in acquiring existing properties, would be to throttle it and to hold down the industrial development of this state at this time. Another negative influence which is holding back the development of the power companies and tending to increase rates is the attitude of certain cities on franchises. Most cities consider the franchise as a revenue producer and not as a help to service, and as a consequence make the utility a tax collector. The constructive view of the thing is that a franchise should be an instrument to promote and produce service at a reasonable cost. The public utilities accept regulation just as the banks accept supervision and they are satisfied with the reconstruction of industry which regulation has brought about. The men in the industry feel that they hold, in a sense, a public office, and that their primary task is one of service to the public. The upholding of power companies will pay, for it means a lowering of rates. Every stumbling block put in the path of progress of the public utilities costs a great deal of money to the management to overcome this obstacle, thus adding to the cost of management which of necessity increases the rates. Mr. Creed closed his talk by stating that it was absolutely necessary for the men in the industry to insist upon facts whenever they heard wide-sweeping statements made by anyone in favor of municipal ownership. These sweeping assertions must be challenged and the facts demanded, and he put upon the men of the electrical industry the responsibility of seeing that discussions relating to the public utility industry proceeded on the basis of facts. Mr. Creed was introduced by Allen G. Jones of the General Electric Company, who read the resolution which was passed by the California League of Municipalities November 10, calling upon the state to take over the power companies and develop the power resources of this state, and he stated that Mr. Creed would proceed to

BUILDERS OF THE WEST — XCII

CAPTAIN EDWARD L. BEACH

It is fitting that the giant superdreadnaught "California," the most powerful fighting machine in the world, electrically operated throughout, should have for its building location Mare Island Navy Yard, home of so many significant traditions of the West. To Captain Edward L. Beach, Commandant of Mare Island Navy Yard, this issue of the Journal of Electricity is affectionately dedicated in appreciation of his personal service to the West and to the nation in the trying periods of war, and in appreciation also for what the Mare Island Navy Yard has contributed to the upbuilding of the West in establishing ideals of efficiency, commercial progress and national service equaled in no other navy yard in the world.

I HEREBY RESOLVE

(a) to sell the electrical idea

(b) not to sell the bottle opener—it is useful for opening shoe-polish cans

JANUARY 1, 1921

analyze the impossibility of this movement. Mr. W. C. Berry of the Western Electric Company, reporting as chairman of the committee on security sales, stated that they had sold in the first week 207 shares of stock to 78 different subscribers, and that while this was but a small beginning he was certain that the total would be more than doubled at the next report of the committee.

Reclamation Representatives Meet at Salt Lake City

Members of the executive committee of the Western States Reclamation Association held a two-day conference in Salt Lake City on December 10 and 11, at which the following members of the committee were in attendance:

R. E. Shepherd, Idaho; Sims Ely, Arizona; James T. Whitehead, Nebraska; Percy A. Cupper, Oregon; Francis G. Tracy, New Mexico; E. F. Blaine, Washington; J. E. Edwards, Montana; W. A. Beard, California; William Spry, Utah, and Governor D. W. Davis of Idaho and his secretary, Frank W. Brown, who are chairman and secretary, respectively, of the committee. In addition to the committee members, W. W. Armstrong of Salt Lake City, treasurer of the committee; Jerome G. Locke of Livingston, Mont.; D. E. Murphy of Dubois, Idaho; Joel L. Priest of Boise, Idaho; P. Hetherton of Portland, Oregon; A. J. Smith of Baker, Oregon; James A. Ford of Spokane, Wash.; N. W. Durham of Spokane; Charles R. Murray of Tacoma, Wash.; W. L. Boise of Portland, and Charles E. Arney of Spokane, prominent in reclamation work, were in attendance. The Nevada, Wyoming and Texas members of the committee were unable to be present.

Provisions of the Smith-Fletcher bill, which is considered the best of the reclamation measures proposed, were discussed, it being the consensus of opinion that this bill was the most likely to secure endorsement from all sections of the country.

Various other subjects were discussed at length, among them being a campaign to convert the East to the idea of Western reclamation; the seeking of assistance from the railroads of the West; the decision to raise a budget approximating $93,000, which includes funds already contributed, for the purpose of carrying on the work of the association.

Much of the material contained in the official reports, as well as some of the plans for future activities, cannot be made public at the present time.

Design of Installations in Western Industries is A. I. E. E. Subject

Industries electrified in the West require different principles in design from similar industries in the East. In the West the industries encounter different conditions as regards growth, cost of electric energy, space requirements and duty, according to L. F. Leurey, who discussed this subject at a meeting of the San Francisco section of the American Institute of Electrical Engineers, December 17.

According to Mr. Leurey, one of the prime considerations affecting the design of the electrical installations in an industrial plant is the duty on the plant and the apparatus. Some industrials, notably beet-sugar factories, operate only three months annually, while the investment charges run during the whole year. Care must be taken to prevent "overmotoring" a plant as such will decrease the power-factor, although it may also decrease the maintenance. With the advent of commission regulation, the problem of determining the economy of electrification has been simplified due to the decrease in the number and variety of rate schedules under which electric service may be purchased.

Other factors discussed were systems of distribution, layout of switchboards, character of wire used and availability of energy from isolated stations.

"City Planning" Subject of Fresno A. A. of E. Meeting

At an open meeting held on December the 18th the Fresno Chapter of the American Association of Engineers was addressed by Miles O. Humphreys, chairman of the City Planning Commission of Fresno. Mr. Humphreys outlined the future possibilities of California, stating that with the state growing at its present rate, some such development as that outlined by the Marshall plan will be a prime necessity.

COMING CONVENTIONS

CALIFORNIA ASSOCIATION ELECTRICAL CONTRACTORS AND DEALERS
Quarterly Meeting—Stockton, Cal., Jan 22, 1921

PACIFIC COAST SECTION, NATIONAL ELECTRIC LIGHT ASSOCIATION
Annual Convention—Del Monte, California, May 25-27, 1921

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS
Annual Convention—Salt Lake City, Utah, June 20-26, 1921

He went on to tell how government figures have shown that California soil will support eleven millions of people.

With this background, Mr. Humphreys outlined the necessity of systematic plans for the growth of California cities so that this growth will be properly proportioned and so that costly revision will not be necessary. He then applied the fundamentals of city planning to Fresno, showing the need of surveys of the railroad situation, industrial districts, traffic arteries, the civic center and the parks and boulevards

Northwest League Well Under Way

The Northwest Electrical Service League which was organized with the California Electrical Cooperative Campaign as a model, at the recent Spokane convention of the Northwest Electric Light and Power Association, has been formally set in operation by two well attended meetings, one held in Seattle November 29 and the other in Spokane December 2.

R. W. Clark, chairman of the Advisory Committee, outlined the aim of the League as the promotion of electrical industry through the coordination of effort in the rendering of better service to the public. A managing committee of nine men was appointed from the twenty members of the Advisory Committee, who have put forth every effort to give this new cooperative league a successful launching. Members of the managing committee are as follows:

R. W. Clark, Puget Sound Power & Light Co., chairman; A. C. McMicken, Portland Railway Light & Power Co.; L. A. Lewis, Washington Water Power Co.; A. S. Moody, Portland office, General Electric Co.; W. D. McDonald, Seattle offices, Westinghouse Electric & Manufacturing Co.; J. I. Colwell, Western Electric Co., Seattle; Geo. Boring, Pacific States Electric Co., Portland; W. M. Meacham, Meacham & Babcock, Seattle, and J. R. Tomlinson, Pierce Tomlinson Electric Co., Portland.

Contrary to original plans to spread the activities of the league over the entire Northwest, it has been decided to first interest, organize and educate the various divisions of the industry in Oregon and Washington. When the organization has been perfected extension to other states will be made.

East Bay Electrical Trades Association Hold Annual Meeting

The fourth annual meeting of the East Bay Electrical Trades Association, December 16, was a banquet and welcome to Lee H. Newbert, who has been appointed division manager of the Alameda County division of the Pacific Gas & Electric Company. Mr. Hugh Kimball, manager of the Kimball Electric Company and president of the East Bay Electrical Trades Association, made the address of welcome to Mr. Newbert, and in doing so paid a warm tribute to Mr. Frank A. Leach, Mr. Newbert's predecessor, who has been promoted to the position of vice-president in charge of public relations and service of the Pacific Gas & Electric Company. Mr. Garnett Young, president, Garnett Young & Company, and Mr. D. E. Harris, vice-president, Pacific States Electric Company, both spoke of the good work that Mr. Newbert has done as manager of the commercial department of the Pacific Gas & Electric Company and also as chairman of the Advisory Committee of the California Electrical Cooperative Campaign.

Dr. B. M. Rahstall, industrial expert of the San Francisco Chamber of Commerce, spoke on "Service," showing that service is the greatest salesman, the biggest force for better business and the self-interest story applied to the Golden Rule.

HAPPENINGS IN THE INDUSTRY

INSULATION RESEARCH PLANNED

The West, more than any other section of the country, will be benefited by the campaign to investigate the principles of insulation which is being taken up by the Division of Engineering of the National Research Council, since the West more than any other section is depending on future high tension transmission. At a recent meeting of the Division's Insulation Committee, over which Chairman F. B. Jewett of the Western Electric Company presided, it was decided that the first step is the gathering together of all the published and known scientific material relating to insulation. The committee also decided to attack the technical problems by providing some research men in the universities with funds and materials supplied by the industries, under the guidance of the National Research Council.

MERGER OF ELECTRICAL INTERESTS

By acquiring control of the Western Power Company of Canada, the British Columbia Electric Railway Company, Vancouver, B. C., has brought about the merger of electrical interests on the lower mainland of British Columbia. The acquisition was accomplished mainly by the B. C. Electric Railway Company guaranteeing the $5,000,000 of Western Power Company bonds.

NEW PLANT TO BE CONSTRUCTED IN SPOKANE

Because of the rapidly growing demand for electric power the Washington Water Power Company is planning the development of 14,000 hp. on the Upper Falls in the Spokane River at Spokane.

The station which is to be constructed here will be unique in that it is to be practically automatic, being operated from the Post Street Substation, 500 feet distant.

A single vertical unit consisting of a 15,000-hp. turbine and a 10,000-kw. generator will be installed. This unit will use the full flow of the river during low water season and will operate under a head of 64 feet. Under the plan as now adopted the water will be carried to the wheel through a steel penstock 400 feet long, beginning at a dam and headgate to be installed just east of the Phoenix mill. The generator will be connected direct to the bus in the Post Street Substation which is the main railway and city distribution center.

MORE MONEY FOR UTILITY INVESTIGATION ASKED

The Bureau of Standards has asked Congress for $2,179,440 to cover expenses of the coming fiscal year. One hundred and twenty-five thousand dollars has been asked for investigation of the standards of practice and the methods of measurements of public utilities.

An additional $25,000 has been asked of Congress by the United States Geological Survey to finish the work of the Super-Power Survey. This will be used largely for the preparation of reports.

PERMIT GRANTED FOR COLORADO RIVER DEVELOPMENT

An application by the Southern California Edison Company for a preliminary permit to develop 2,500,000 horsepower of electric energy from the waters of the Colorado river has been accepted by the Federal Power Commission.

John B. Miller, president of the company, said the acceptance of the preliminary application meant that publication and other legal forms which precede the granting of hydroelectric rights would be begun. The company plans to make the electric energy available in California, Utah, Arizona, Nevada and Colorado.

In connection with his announcement, Mr. Miller issued a statement in which he said:

"This application contemplates the development of power on the Colorado river above the Boulder canyon project. The permit will allow the Edison company time for surveys, investigation and the perfecting of financial plans for the construction of the dams, conduits and power houses at Marble canyon and Diamond creek, not including the possible power development in the Grand canyon and other sites along the National Park. The total possible hydroelectric development of the Colorado river is more than 4,000,000 horsepower, which is equal to one-half the total hydroelectric power now generated in the entire United States."

Through the development of this river, which drains a watershed of 250,000 square miles and has an annual run-off of 16,000,000 acre-feet, it is estimated that electric energy can be furnished for the operation of trains on 15,000 miles of railroad, consisting of six existing and two proposed transcontinental lines, and still leave 65 per cent of the generated power for general commercial, agricultural and industrial purposes. Details and a profile of this project will appear in the January 15th issue of the Journal of Electricity.

Power site in the heart of Spokane which is to be developed at once by the Washington Water Power Company. This is the last hydroelectric power available within the city limits.

REAL ESTATE ASSOCIATIONS MOVE TO HASTEN RECLAMATION PROJECTS IN THE WEST

The real estate men of the West are joining together in a common effort to bring about Congressional appropriations large enough to allow the Department of the Interior to increase its program of Reclamation Service which will involve vast hydroelectric development. Resolutions to this effect were passed at recent conventions of the real estate men of California and Utah and the Realty Association of the Northwest. The following was passed at the convention of the Utah State Realty Association:

Whereas, The interests of the Western states are very closely related, especially as regards the reclamation and development of the public lands, many millions of acres of which might be made more productive with the proper cooperation of the government of the United States,

Resolved, That the Utah State Realty Association endorses this movement and suggests that a convention be called to consider the best interests of all the states concerned and the best method of procedure; and be it further

Resolved, That in this resolution by the Utah State Realty Association we pledge our support provided the irrigable acreage of the headwater states of the Colorado and Snake rivers be absolutely safeguarded."

Letters from the governors of Oregon, Washington, Utah, Nevada and Arizona were read at the convention of the California Real Estate Association urging that the realty men help to obtain the federal appropriations which will make possible the reclamation work so necessary to the development of the West.

In a letter to the association the Secretary of the Interior stated that no new reclamation projects can be started until those already under way are completed. It is therefore necessary that appropriations be made large enough to cover this cost and to start new work.

The realty men of the West will work through the Information Bureau of the National Association of Real Estate Boards located in Washington. The possibility of sending a committee to represent the realty men of the West in Washington during the coming congressional session.

INTER-MOUNTAIN ELECTRIC COMPANY HOLDS SALES CONVENTION AT SALT LAKE CITY

The annual sales convention of the Intermountain Electric Company was held at the Commercial Club, Salt Lake City, from December 6 to 11, inclusive. One of the features of the convention was a two-day series of demonstrations and lectures by representatives of the Westinghouse Electric & Manufacturing Company and the Westinghouse Lamp Company, known as the "Better Merchandising Shows." Such shows are prepared and shown for the benefit of electrical dealers throughout the country.

Among the principal speakers at the convention were Lafayette Hanchett, president, and C. B. Hawley, vice-president and general manager of the Intermountain Electric Company.

Because there are 14,000,000 American homes not wired for electricity against 700,000 which are electrically wired; because there are 2,000,000 farms with no electrical facilities against 200,000 electrical ones, and because a moderate estimate shows that every man, woman and child is a prospect for at least $18 worth of electrical merchandise, these salesmen of the Intermountain Electric Company met in conference at Salt Lake City to plan an extensive sales campaign. C. C. Campbell, sales engineer, conducted this convention.

ANOTHER AMENDMENT TO THE WATER POWER LAW

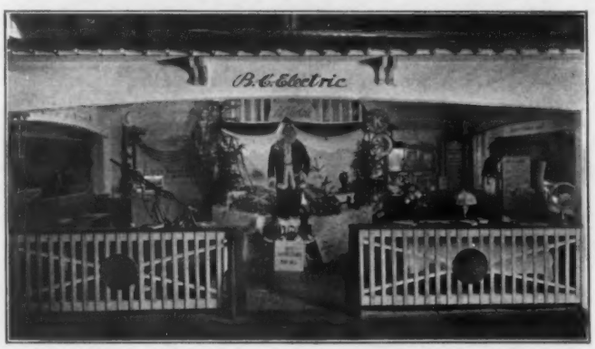
As yet no committee action has been taken in either house of Congress concerning the amendment to the water-power act which is intended to protect the national parks. As drafted by Secretary Payne the amendment provides that no permit, license, lease or authorization for dams, conduits, reservoirs, power houses, transmission lines or works for storage or carriage of water will be granted within the limits of any national park.

Another amendment which is considered probable is the one introduced by Representative Rogers of Massachusetts, which is designed only to repeal the provision of the water-power act which authorizes the issuance of water-power licenses in national parks.

PLANS MADE FOR ANOTHER SHOW

Because of the unqualified success of the electrical show which was held in Vancouver recently under the auspices of the British Columbia Electrical Cooperative Association, and especially because of the impetus which it has given to the electrical industry in that section of the country, plans are being made already for a more extensive show next year. The success of this show, which was visited by some ten thousand people, is largely due to the efforts of the Electrical Show Committee. The members appear in the photograph as follows:

Front row, left to right: H. Pim, district manager, Canadian General Electric Co., treasurer; E. E. Walker, sales manager, B. C. Electric Railway Co., show manager; James Lightbody, publicity manager, B. C. Electric Railway Co., secretary.
Back row, left to right: W. C. Mainwaring, district sales manager, Northern Electric Co.; W. W. Fraser, electrical contractor; S. E. Jarvis, Jarvis Electric Co.; E. H. Hughes, Modern Utilities Co.; J. Muirhead, provincial inspector of Electrical Energy; E. Brettell, Electric Supply and Contracting Co.



A timely and unusually attractive booth was presented by the British Columbia Electric Railway Company

GOVERNMENT TO ENCOURAGE PAPER MAKING IN ALASKA

The providing of facilities for the manufacture of paper in Alaska is an activity of the national forest service, according to Philip H. Dater, district engineer of the federal bureau, who with C. A. Lord, a bureau engineer, has returned to Portland from a two months' trip to the southeastern peninsula, surveying a water-power project for paper manufacturing. Dater says that there is a lively inquiry in Alaska for pulp material and several investigators are in the field. Building of roads and trails by the forces of the federal government is carried on with a view to making power sites in the northern territory accessible.

THE MIDWAY OIL FIELD IN SOUTHERN CALIFORNIA

In September of 1920 California led all states in oil production, with a daily average of 304,267 barrels. The Midway field shown above is one of the important sources of supply and is at present a center of new drilling activities.

PORTLAND ADOPTS ELECTRICAL CODE

In the new code of the City of Portland, an attempt has been made to arrange the rules in a more logical order and to group and classify the subject matter in such a manner that the user may readily find the particular regulations governing the work in hand.

The new arrangement is logical in that each part includes, as far as possible, all of the regulations governing the class of work in question, and the order of the subject treated is such that each succeeding section can be readily understood without reference to any section following. The different sections are emphasized by the use of sub-headings set out in large type.

Notable besides arrangement in the new code are the regulations for motors, the inclusion of safety to life regulations and of a complete index.

The code is the work of Mr. Lew Wallace Going and a committee of electrical contractors and engineers.

The headings to the various parts are as follows:

"Administrative Provisions," "Definitions and General Requirements," "Installation of Conductors," Protective Grounding of Circuits and Equipment," "Installation of Switches, Cutouts and Cabinets," "Installation of Services and Meters," "The Installation and Wiring of Equipment," "Wiring Requirements for Buildings of Certain Occupancies," "Installation of Signalling Systems," "Requirements for Electrical Driving and Control of Fire Pumps."

PUBLIC UTILITIES POST NOTICE

NOTICE TO THE PUBLIC

The Public Utilities Commission
HAS JURISDICTION OVER

1 Boat	7 Street Railroad
2 Electric Power	8 Telegraph
3 Express	9 Telephone
4 Gas	10 Water
5 Railroad	11 Warehouse
6 Sleeping Car	12 Wharf

RATES — SERVICE — REGULATIONS
Except Those of Cities and Villages and Mutual Companies

If you have any question, complaint or suggestion as to any rate or fare charged, or as to the kind or adequacy of any service furnished, or as to the scope or effect of any regulation or rule, please inform the Commission.

We Can Help You Only When We Know Your Needs

Address, phone or call on

The Public Utilities Commission
BOISE, IDAHO

The Public Utilities Commission of Idaho is requiring the public utilities of the state to post the notice shown here in a conspicuous place in each of their main and local offices as well as in street cars and ferry boats. This is considered an excellent means of telling the public that the Commission has jurisdiction over the public utilities.

PACIFIC SERVICE HOLDS CHRISTMAS ENTERTAINMENT

The fourth annual Christmas entertainment of the Pacific Service Employes' Association, consisting of a pageant and costume ball, was held in the Scottish Rite Auditorium, San Francisco, on the evening of December 17.

"The History of California" is the title of the so-called Polyphase Pageant of Progress presented in seven phases.

A 1925 EXPOSITION IN PORTLAND

An exposition to celebrate the completion of the Atlantic-Pacific highway, the centennial of the discovery of the electric magnet, the coming of peace and the restoration of world trade, is being planned by the citizens of Oregon. It has been decided by the committee in charge of preliminary arrangements to ask Senator G. E. Chamberlain to introduce in Congress a resolution issuing an invitation to the nations of the world to take part in the exposition. It will be called "The Atlantic-Pacific Highways and Electrical Exposition."

This is the attractive A B C store in Spokane, Washington. There is no doubt about the successful washing machine sales which are being made from a shop which maintains the standard which a glance at this one shows.

PUMPING AND DISTRIBUTION SYSTEM TO BE CONSTRUCTED IN UTAH

The Bonneville Irrigation District has accepted the bid of the Shattuck Construction Company of San Francisco for the construction of an electrically operated pumping plant and distribution system for the district, thus disposing of the $600,000 irrigation district bonds voted by the district a few months ago. This new irrigation plant will greatly increase the productivity of 5,000 acres of land in the southern end of Davis county, Utah.

CO-OPERATIVE CAMPAIGN PROGRAM FOR THE COMING YEAR

According to the program which has been outlined for the field representatives of the California Electrical Cooperative Campaign during 1921, a special phase of the Campaign

This industrial lighting exhibit was opened in San Francisco under the direction of the California Electrical Cooperative Campaign on the 18th of November. Since that time five demonstrations have been held, the attendance totaling 320. Beginning January seventh a demonstration will be held every Friday evening. Special invitations will be sent to individual business men of all lines of industry, until the entire field for the subject of industrial and commercial lighting has been covered.

work will be emphasized each month. The following tentative program of subjects for the first six months of 1921 has been arranged:

January—Industrial and Commercial Lighting.
February—Convenience Outlets.
March—Contractor-Dealer Accounting.
April—Financing Hydroelectric Development Through Self-Interest.
May—Salesmanship and Service to the Public.
June—Your Responsibility to the Industry.

The Campaign is hoping that during each month all its contributors will keep the subject of that month's effort in the minds of the members of the industry by means of personal discussion, letters and advertising on the subject, so that every member of the industry will realize its importance. A bulletin will be mailed to all contributors before the first of each month stating the essential facts on the particular subject. The Campaign especially requests each contributor to have these bulletins copied and distributed to all members of his organization whose work gives them a direct interest in these subjects or brings them into contact with others who have a direct interest.

The October and November report of the Advisory Committee mentions a new bulletin on "How to Operate a Modern Electrical Home Exhibit" and ten feature stories on electrical homes which are to be released to newspapers of California early in 1921. It also announces that the University of California and the Journal of Electricity are cooperating with the Cooperative Campaign by preparing a course in elementary accounting, tying in with standard contractor-dealer systems.

Plans for a Speaker's Bureau of prominent electrical men who will present the story of the industry to civic organizations and clubs are presented and the announcement is made of Robert L. Eltringham as the new executive secretary.

POSSIBILITIES OF THE INTER-MOUNTAIN REGION REVIEWED

A report on the irrigation and water power possibilities of the intermountain region has been prepared for the Utah State Realty Association by Ralf R. Woolley of the United States Geological Survey.

This report states that the development of the American Falls reservoir site on the Snake River in Idaho will more than double the 1,296,000 acres of land now irrigated in the Snake River Valley.

The survey estimates that about 500,000 hp. are available on the Snake River in Idaho and that less than one-tenth of that amount is developed. The most intensive water-power development in the intermountain region has been made in the Great Salt Lake basin. Here there are approximately fifty hydroelectric power plants with a total installed capacity of nearly 160,000 hp., while the undeveloped power aggregates about 150,000 hp.

Does the gas heater explode every time you want a hot bath?

MAKE IT AN ELECTRICAL CHRISTMAS WITH AN ELECTRIC WATER HEATER

NO OFFENSE INTENDED

A Letter to the Editor

Journal of Electricity—Gentlemen:

As a subscriber to and reader of your publication, we take exception to the contents of the inclosed clipping from page 511 of your December 1st issue.

In answer to the question in the clipping we say most emphatically, "NO." A gas heater does not explode every time you want to take a hot bath, in fact, we find in Honolulu that people can take one hot bath or a dozen hot baths each day without any danger of an explosion. Of course, if people take a hot bath only once a year the gas heater might be entirely out of order through lack of use and attention but people here, as well as elsewhere, we think, really take hot baths very frequently.

It is advertising of this sort which is misleading and not a statement of facts.

About a year and a half ago a campaign for electric ranges was started in Honolulu and advertising of this sort was used, with the result that we also did some advertising in which we showed from statistics of the local fire department, that out of 122 fires in Honolulu during 1918 not one was traced to gas, whereas electric current caused 25 of these fires. No death has ever been caused by gas in Honolulu, but many people have been electrocuted.

What would you think of advertising wherein we said, "Death lurks in the electric wires of your house as they may be crossed with the 2300-volt wires in the street. Make this a Gas Christmas"? Or, "Do you ever get a shock from the electric light socket? Many people have been killed by shocks from these fixtures, therefore, make it a Gas Christmas"?

Yours for fair advertising,

HONOLULU GAS COMPANY, LTD.

P. G. & E. BOND ISSUE

Pacific Gas & Electric Company has been authorized by the Railroad Commission to issue and sell at 93½% of their face value, plus accrued interest, $10,000,000 of 7% 20-year bonds, or interim certificates of a like amount. The proceeds of the bond sale are to be used by the utility in meeting the cost of developing hydroelectric power projects on the Pit river, Shasta county. It is estimated that during 1921 and 1922 the Pacific Gas & Electric Company and the Mount Shasta Power Company, a subsidiary, will have to spend more than $20,000,000 for new plants and for additions and betterments to their properties.

The syndicate and other bond houses offering this issue state that there is an active demand for these bonds. In speaking of the importance of hydroelectric power to the industrial development of the West, E. H. Rollin & Sons, one of the syndicate members, says:

"From an industrial point of view, the only available fuel in this territory is oil, which is being exhausted and is now selling at higher prices than ever before. This condition is resulting in the substitution of electric for steam power and, together with the rapid growth of the territory served, has created an unprecedented demand for electric energy, which the company, through its Pit river properties, is in a position to develop.

"The prevailing nation-wide high price of fuel necessary for the production of steam power is turning the eyes of industry to the Pacific Coast as a manufacturing field.

"It is not improbable that water powers will again be the primary factor in the industrial development of the United States and that California, with its enormous power resources, will change, within the life of these bonds, from an agricultural to an industrial state which will absorb many times its present and prospective power developments."

SOUTHERN CALIFORNIA EDISON COMPANY APPLIES FOR BOND ISSUE

To secure funds with which to finance hydroelectric power developments on the San Joaquin and Kern rivers, and to make additions to its transmission and distribution systems, the Southern California Edison Company applied on December 22 to the Railroad Commission for authority to make a bond issue of $10,000,000 and to issue 100,000 shares of common capital stock, par value $100. In connection with the stock application the company sets up the claim that the cost of its operative properties, as of October 31, 1920, is $102,394,923.80.

ONTARIO POWER COMPANY STOCK ISSUE

The Ontario Power Company, operating in San Bernardino county, California, has been authorized to issue $38,000 of its 7 per cent cumulative preferred stock and use the proceeds to reimburse because of earnings expended for plant extensions, additions and betterments.

SAN JOAQUIN MORTGAGE SERIES BONDS

San Joaquin Light & Power Corporation applied Dec. 21 to the Railroad Commission for authority to issue $2,375,000 par value of its first and refunding mortgage Series "C" bonds. The proceeds are to be used to reimburse this company for or to provide the cost of making additions, improvements, extensions and betterments to its property.

BOND ISSUE FOR CEDAR FALLS

As the result of a resolution unanimously adopted by the city council recently, $2,005,000 of utility bonds will be sold by the city to raise funds for the continuance of Light Department work at Cedar Falls, the Lake Union steam plant and on the hydroelectric development in the Upper Skagit valley. Municipal light and power bonds in the sum of $1,005,000 and $1,000,000 in Skagit bonds will be sold. They will be offered in $1,000 denominations, with interest not to exceed 6 per cent. Bids will be received until January 3. It is estimated there is sufficient money now available to continue work on the Skagit until January 25, when it is anticipated there will be more money available from the sale of bonds. The current payroll at Cedar Falls has been taken care of and more money will be available for work there after the sale of bonds.

TRADE NOTES

Westinghouse Earnings for Six Months —

The Westinghouse Electric & Manufacturing Company announces that its sales billed during the six months period from April 1 to September 30, 1920, amounted to $78,771,675. The sales billed during the previous year ending March 31, 1920, totaled $136,053,092.

Electrical Exports From U. S. During 1920 —

The excess of electrical exports for the first ten months of 1920 over those of 1919 amounts to more than $2,600,000. More than a million more motors have been exported during 1920 than during 1919, and the same is true of dynamos and miscellaneous items. Reports also show nearly four-fifths of a million increase on wiring supplies and rheostats, and almost half a million excess on magnetos, spark plugs and transformers.

Equipment Company Changes Name —

The name of The Lewis and Roth Corporation, of Philadelphia, has been changed to Electric Power Equipment Corporation. No change has been made in the company organization, the new name being chosen as one more indicative of the field covered.

Cable Company Announces Staff Changes —

The Standard Underground Cable Co. announces the following changes in its Pacific Coast staff:

Richard G. Harris succeeds, as Pacific Coast manager, John P. Bell, who will hereafter devote his time to the growing demands of his export and import business.

Vinton Smith, who has been connected for several years with the San Francisco office staff, has been appointed assistant Pacific Coast manager, and W. G. Stearns, also for many years with the company on the Pacific Coast, has been appointed special sales agent.

Company Incorporated in Seattle —

The Power Plant Engineering Company, of Seattle, maintaining offices in the L. C. Smith Building, recently filed articles of incorporation, naming a capitalization of $25,000. The company, according to its officials, plans conducting a general engineering, constructing and manufacturing business. The incorporators are: W. J. Santmyer, president, R. S. Whaley, vice-president and manager of the Power Plant Engineering Company, A. E. MacInnis, secretary-treasurer, and H. S. Elliott, attorney for the company.

U. S. Electrical Manufacturing Company —

The ownership of the U. S. Electrical Manufacturing Company, of Los Angeles, pioneer manufacturers of electric motors on the Pacific Coast, has recently been changed. The present ownership and control of the company has been brought about through an affiliation of interests of Harry G. Steele of Pittsburgh, Pa., and Carl E. Johnson of Los Angeles, California.

New Magnesite Brick Plant —

The Vitrafax Company of Los Angeles is establishing a plant on a three-acre site on Pacific Boulevard for the manufacture of magnesite brick, a product largely used in electrical furnaces for which there is an active local demand.

Safety Switch Company Changes Name —

The Myers Electric Safety Switch Company of San Francisco announces that it is changing its name to the Western Safety Manufacturing Company, Inc.

I HEREBY RESOLVE

(a) to hope for the best

(b) not to hope for the appointment of a democrat for postmaster

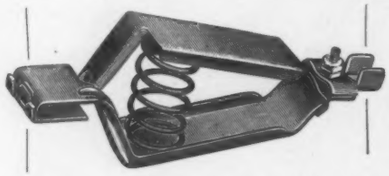
JANUARY 1, 1921

LATEST IN EVERYTHING ELECTRICAL

(A variety of new electrical equipment ranging from a standardized outdoor substation to a new battery clip is presented on this page. A definite advance is shown in the new line of ammeters and voltmeters described here as well as in the method of using solenoid brakes for speed control and in the development of a new portable drill.—The Editor.)

UNIVERSAL BATTERY CLIPS

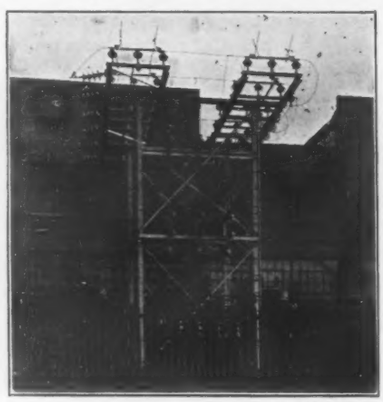
For use as a quick and ready means of connecting storage batteries for charging, the Mueller Electric Company of Cleveland, Ohio, have manufactured a series of lead-covered clips. The manufacturers state that by fitting the connecting cords with universal clips and by snapping them over the battery terminals it is possible to charge lighting and starter batteries without disconnecting them or removing them from the car.



This No. 33-A is made of copper and is lead coated. It has a spread of jaws 2 inches and may be used up to 400 or 500 amperes for short tests. Its regulation capacity is 200 amperes. This illustration is one-fourth actual size.

STANDARDIZED OUTDOOR SUBSTATION

The Delta Star Electric Company of Chicago are now shipping their standard Unit Type steel tower outdoor substation for taking care of two incoming lines and two banks of transformers. Each incoming line and each tap circuit with power transformers is provided with a three pole air break switch operated from ground levels. Choke coils, fuses and high tension metering equipment are provided for each set of transformers.



A typical installation of the standardized outdoor substation

A NEW CONNECTOR

The jam-nut is used in a connector which has been developed by R. A. McBeth, 1424 Girard street, Los Angeles. The wire grooves are V-shaped to afford greater contact surface, while one screw and one nut secure as many as five wires.

NEW ADHESIVE PAPER TAPE

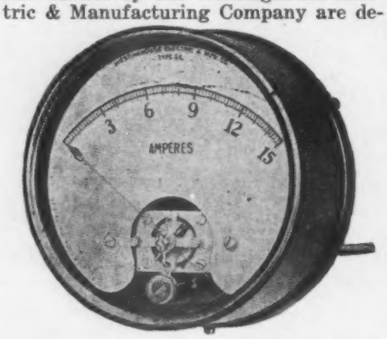
For taping coils and for general repair work, the Irvington Varnish & Insulator Company, Irvington, N. J., has perfected an adhesive paper tape which is said to have high mechanical and dielectric strength.

NEW CONVENIENCE IN IRONING MACHINE

The Utensils Co. of Fort Wayne, Indiana, has developed an ironing machine with one open end, so that skirts and similar garments can be slipped over it instead of having to be ironed double.

AMMETERS AND VOLTMETERS FOR SPECIAL APPLICATIONS

The type DX instruments placed upon the market by the Westinghouse Electric & Manufacturing Company are designed for use on switchboard panels, on radio communication sets, on farm lighting and other small charging and lighting panels. Also, they are suitable for use on marine, dental, telephone and telegraph panels. The instruments may be used in conjunction with a magneto to indicate speed as well as in conjunction with search coils to indicate temperature. The manufacturers state that these instruments operate on the D'Arsonville principle, and are capable of standing vibration such as is found on shipboard, without impairing their accuracy and reliability, hence the combination passing through it, thus the temperature of the strip is proportional to the current.



The new DX Westinghouse Ammeter

SELF-LOADING ELECTRIC TRUCK

The industrial self-loading truck of improved design recently placed on the market by the Industrial Truck Company, division of Cowan Truck Company, Holyoke, Mass., is all-steel and guaranteed for 5,000-lb. capacity.

WATER-LEVEL INDICATOR

A long-distance indicator intended primarily for application in forebays of hydroelectric plants has been placed on the market by D. W. Proebstel of Portland, Oregon. This device consists of a direct current motor whose field poles are changed in polarity when the water level changes. The control, which is placed at the measuring point and is actuated by a float, is connected by five wires. Usually this indicator is built for operation at 120 volts direct current.

FLEXIBLE CONDUIT FITTING

The Nicholson box connector for metallic flexible conduit has been placed on the market by the Nicholson Electric Fittings Company of Wilkes-Barre, Pa. It has a projection on the clamp and inside sleeve which engages in the groove of the conduit. The manufacturer says that it is adaptable to several sizes and types of metallic conduits because of its adjustable clamp.

SMALL TURBO-GENERATOR

The small Curtis steam turbine generating sets built by the General Electric Company are fully described and illustrated in Bulletin No. 42010A which supersedes Bulletin No. 42010.

A NEW WATER SYSTEM

The Thompson Manufacturing Company of Des Moines, Iowa, has recently placed a self-contained electrically operated water system on the market.

THE GECO RESISTOR

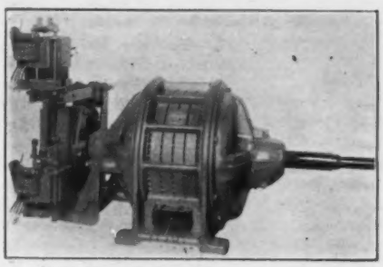
The Geco Resistor is an automatic regulating device, manufactured by the General Electric Company, which maintains practically normal voltage on the headlight lamp with varying trolley potential. The manufacturers feel that this resistor will appeal strongly to operating companies because of the low initial cost and maintenance, and because there are no moving parts or contacts to get out of order. They state that it has a pronounced positive temperature coefficient and that with a drop in trolley voltage, the resistance of the Geco becomes correspondingly less, thus maintaining practically constant current through the headlight lamp.

The Geco resistor with covers opened. It will be seen that this device consists of six Geco units mounted in porcelain sockets, and three resistance sticks, two of which are used to dim the headlight within city limits. The third stick is to adjust the Geco for the maximum trolley voltage of the system.

APPLICATION OF THE SOLENOID BRAKE

The use of solenoid brakes for the speed control of induction motors on cranes and hoists has been greatly extended, due to their recent applications in connection with other forms of electric braking.

The two forms of brake as developed by the General Electric Company are the multiple magnet, and the solenoid load brake. The former is simply two solenoid brakes combined so as to form one brake actuated by two or more independent magnets. The mutiple system is used to give gradations in the



Showing brake with two solenoid brakes attached to a G. E. induction motor

speed control, being particularly adaptable to apparatus which moves in a horizontal direction. As each solenoid is de-energized, a fraction of the braking torque is applied until enough have been de-energized to bring the apparatus to a full stop. The number of magnets used depends upon the conditions of service.

The other variety of brake, or the solenoid load brake, is designed for the control of induction crane hoist motors used where a number of varieties of loads are handled by the same hoist. This load brake consists of two solenoids, one in the stator circuit of the motor and the other in the rotor circuit. The former is light enough so that very little braking action is obtained from its operation. If the latter is de-energized, however, it applies heavier weight to the braking levers and consequently increases the braking effect.

RATCHET-LOCK SWITCH HANDLE

Where the general public has access to such lighting fixtures as are controlled by rotary surface snap switches, used frequently in apartment houses

The new line of ratchet-lock switch handles

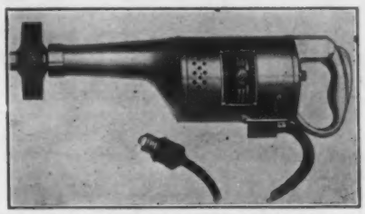
and industrial installations, the handles are often misappropriated or lost. To overcome this disadvantage and interference to the proper functioning of such switches, the Bryant Electric Company of Bridgeport, Conn., have produced the Security Ratchet-Lock Snap Switch handles, which can be had in all types of snap switch handles—small round fluted handles and large and small flat handles, in both porcelain and durable composition.

TURN-CANDLE SOCKET

A turn-candle socket for the individual control of lights is being marketed by the Bryant Electric Company of New York City.

A NEW PORTABLE DRILL

A new portable electric drill is being manufactured by the Wodack Electric Drill Corporation of Chicago. The motors are designed by the manufacturers and are series laminated type and self-



The Wodack portable electric drill with automatic stop switch

adjustable in speed to the size bits used. The switch is of a quick make and break, located in the top handle, and operated with the palm of the hand. The switch shuts off current automatically when pressure is released, thus avoiding the drills running empty.

In addition to the drill, the company is manufacturing a portable grinder equipped with the same style of control.

Books and Bulletins

Booklets for the Washman

Realizing that there is a considerable field for electric washing and ironing machines among the Chinese laundrymen, the Manaham Company of Chicago

Leaflets which sell the electrical idea to the Chinese laundryman

has published a series of leaflets which tell the story of their laundry machinery in Chinese and with the aid of pictures. Needless to say these attract unusual attention from the American laundrymen as well.

Electrical Goods in Spain

"Electrical Goods in Spain" is the title of the latest report which has been published for the benefit of American manufacturers and exporters of all sorts of electrical merchandise. It covers the Spanish market in detail. The important electrical goods classifications are treated separately, while packing, shipping, advertising, etc., receive special attention, and a list of importers and dealers is available.

The proximity of Spain to European manufacturing centers is a disadvantage to be overcome by precise knowledge and adroit salesmanship. The purpose of the report is to provide the requisite data for the effective cultivation of this increasingly important market.

Copies can be obtained by applying in person to any of the district or co-operative offices of the Bureau of Foreign and Domestic Commerce.

The Bureau of Mines

The Bureau of Mines has recently issued Technical Paper 264, "Preliminary Investigations of Storage Battery Locomotives; Specifications, Laboratory Tests, Permissible Schedule," by L. C. Ilsley and H. B. Brunot, electrical engineers of the Pittsburgh Experiment Station of the Bureau of Mines.

Booklet on the Ammonia Process

The scientific paper of R. S. Tour on "Direct Synthetic Ammonia Process" has been reprinted in the Journal of Industrial and Engineering Chemistry in booklet form.

University Publications

The University of Washington has issued the following bulletins: "Ornamental Concrete Lamp Posts," by Carl Edward Magnusson, "Multiplex Radio Telegraphy and Telephony," by Francis M. Ryan, J. R. Tolmie and Roy O. Bach, and "Voltage Wave Analysis with Indicating Instruments," by Leslie Forrest Curtis.

Testing Equipment Presented

The Delta-Star Electric Company, Chicago, are distributing a new leaflet describing their 40,000-pound testing equipment for mechanical testing of insulators, bus supports and switches which will be subject to heavy mechanical stress.

Bureau of Standards

Recent publications of the Department of Commerce of the Bureau of Standards appear under the following titles: Airplane Antenna Constants, by J. M. Cork; A Standardized Method for the Determination of Solidification Points, Especially of Naphthalene and Paraffin, by R. M. Wilhelm and J. L. Finkelstein; Standardization of the Sulphur Boiling Point, by E. F. Mueller and H. A. Burgess; Spectral Photoelectric Sensitivity of Silver and Several Other Substances, by W. W. Coblentz, Associate Physicist, and H. Kahler, and A Relation Connecting the Derivatives of Physical Quantities, by Mayo D. Hersey.

Article on Cleaner Attachments

Royal Breezes, a dealer's house organ published by The P. A. Geier Company, Cleveland, contains an interesting item in the December issue on the subject of selling electric cleaner attachments. The author points out that the offer of attachments is too frequently an afterthought on the part of the salesman and that more successful results will follow if the cleaner and attachments are presented to the housewife as a complete cleaning service rather than as a machine with accessories.

Calendar Showing Steel Manufacture

The Youngstown Sheet and Tube Company of Youngstown, Ohio, announces their 1921 calendar which contains twelve two-color illustrations showing interesting processes in the manufacture of iron and steel. They also state that they will send readers of the Journal of Electricity one of these calendars on receipt of six cents in postage to cover the cost of wrapping and mailing.

NEW ELECTRICAL DEVELOPMENTS

(Two power plants are being planned in the Northwest, and an electrical appliance show is reported, as well as plans for improved street lighting. Items which indicate the rapid advance in the electrification of industry are among those of the Pacific Central District and also those of the Pacific Southwest. From the latter also comes significant news of a city's return to a rigid electrical code. An electrical survey and plans for the construction of a 110-ft. dam are important among Inter-mountain items.—The Editor.)

THE PACIFIC NORTHWEST

PORTLAND, ORE.—G. F. Mathews of Hoquiam, Washington, has purchased a large tract of land in Lipton on which he will erect a shipbuilding plant.

MILTON, ORE.—C. H. Harris of the Milton Box Factory has stated that a suitable building will be erected for the new sash and door factory to be started and operated by the Company.

PORTLAND, ORE.—The state engineer has been petitioned for water rights for an electric mining project in the Santiam Hills north of Mehama. The water is to be taken from Horn Creek.

BURBANK, WASH.—At a recent meeting of the Commercial Club, the subject of putting in street lights was discussed and the club went on record as favoring the installation of lights. Mr. Kitrell and A. A. Lopp will see to the installation work.

TACOMA, WASH.—The city council has authorized the installation of electric power at Green river purification plant and intake. Authorization has also been given for the purchase of $15,000 worth of copper wire and transformers to cost about $20,000.

PORTLAND, ORE.—The Shevlin-Hixon Company will add a battery of five tubular boilers to the eleven now in use, in order to take care of much larger pine milling operations. The work will be started about Jan. 15 and will require the employment of about 40 men.

TACOMA, WASH.—An exhibition of electrical appliances was conducted here by the Westinghouse Electric & Manufacturing Company from December 13 to 18, inclusive. Many Christmas suggestions were displayed and factory representatives were present to give instructions to prospective purchasers.

SALEM, ORE.—During the months of August and September, 88 permits to appropriate water were issued by the state engineer, Percy A. Cupper, covering the use of water for irrigation of approximately 3400 acres of land, development of 540 horsepower, domestic supply, municipal use, mining and various other uses.

SALEM, ORE.—S. A. Mushen and G. D. Cronemiller of Lakeview, Ore., have made application with the state engineer to appropriate water from Camas and Deep creeks, tributary to Warner lake, for power development. Power developed from the water of these streams will be used for the operation of various industries in Goose Lake Valley.

HOQUIAM, WASH.—Two bids have been submitted to the city council for installation, maintenance and operation of an ornamental boulevard lighting system in the business section of the city. The lower bid was submitted by the Grays Harbor Railway & Light Company, providing three different styles of poles at costs of $93, $95 and $98 each, and has been given to city engineer W. L. Lovejoy for an opinion.

MEDFORD, ORE.—The construction of a power plant and the enlargement of several miles of ditch for the development of 154 horsepower and the irrigation of 780 acres of land in Jackson county is contemplated by M. F. Hanley of Medford, who has filed with State Engineer Cupper an application covering the appropriation of water from the north fork of Little Butte creek. It is estimated that the development will cost approximately $44,000.

SALEM, ORE.—Application for permission to appropriate 70 second-feet of water from Anna creek in Klamath county for the development of 1000 hp. for lighting and pumping purposes has been filed with the state engineer's office. The project contemplates the construction of a pipe line 10,000 feet long, the entire project to cost approximately $50,000.

SALEM, ORE.—An application for permission to appropriate 160,000 acre-feet of water from the Klamath river to be stored in the lower Klamath lake, has been filed in the office of the state engineer by Roy E. Swigert, trustee of the Klamath-Shasta Valley project of Montague, Cal. The proposed irrigation project contemplates the storage of water in lower Klamath lake to be returned through the Klamath strait to the Klamath river for power development in California.

THE PACIFIC CENTRAL DISTRICT

SAN RAFAEL, CAL.—The contract for electroliers on Court House Square has been let to E. E. Boble for $1,486.

FORTUNA, CAL.—The Pacific Lumber Company is to install a 2000-hp. generator for the electrification of its plant.

HOLLISTER, CAL.—H. J. Sherman has stated that his men can lay 100 feet of conduit a day and thereby keep ahead of Greenep & Johnson, who have the contract for installing electroliers.

GRASS VALLEY, CAL.—In spite of a petition signed by hundreds of citizens, the city trustees have granted a franchise to the Pacific Gas & Electric Company for a period of fifty years to erect poles and run wires along the streets of the city for power purposes.

SAN JOSE, CAL.—Plans for a new, strictly modern 150-room hotel in the downtown section of San Jose are being discussed by Henry G. Walker, hotel building expert, with prominent men of this city. It is claimed the proposed hostelry will cost about $1,250,000.

SAN FRANCISCO, CAL.—Congressman John I. Nolan, in a telegram to Supervisor Richard J. Welch, chairman of the San Francisco naval base committee, stated that all hearings on the naval base site selection have closed and the selection will be made about February 1.

OROVILLE, CAL.—At a conference between representatives of Thermalito and the proposed Table Mountain Irrigation District in Oroville, plans for the construction of an impounding reservoir in the Concow Valley were discussed. This dam would be built in cooperation with the Pacific Gas & Electric Company, the latter to use it for the making of power. The water would be turned over to the district for irrigation purposes.

WESTWOOD, CAL.—Three 2,000-kw. transformers have arrived here for installation in the new Feather river power plant of the Red River Lumber Company. A penstock 900 feet in length is being constructed and a great amount of power house equipment is being installed. This power plant is to supply the town of Susanville with lights and power besides meeting the extensive needs of the lumber company.

SAN FRANCISCO, CAL.—Boulder Creek Electric Light and Water Company has been authorized by the Railroad Commission to amend its mortgage so as to provide for an issue of first and refunding mortgage bonds instead of first mortgage bonds, and directly reserve $18,500 of bonds to pay or refund bonds of the Mountain Light and Water Company, the system of which was recently purchased by the Boulder company.

ROSEVILLE, CAL.—The city has obtained from the Railroad Commission an order approving its application for authority to purchase from the Pacific Gas & Electric Company the utility's system for the distribution of electricity in Roseville. The city will serve all the company's consumers except the Southern Pacific, Roseville Water Company and the Pacific Fruit Express Company, which will buy energy from the Pacific company. The price of the system is given as $6,539.

SAN FRANCISCO, CAL.—According to Major-General Lansing H. Beach, chief of the army engineers, harbor and waterways improvement and maintenance work for the entire country will require an appropriation of $78,207,665 for the fiscal year of 1921. The recommendations which he has made will be incorporated in the annual estimates submitted to Congress at its present session. Recommendations for appropriations for the San Francisco district totals some $2,144,000.

STOCKTON, CAL.—A certificate declaring that public convenience and necessity require the construction of a power plant on the Stanislaus River has been sought from the Railroad Commission by the Sierra and San Francisco Power Company and the Pacific Gas & Electric Company in a joint application. The system of the Sierra company is now being operated by the Pacific company under lease. The power project for which construction authority is sought is, according to the application, to be located on the middle fork of the Stanislaus River at a point known as Spring Gap. From the Spring Gap power house the energy will be conducted over a transmission line approximately 18 miles in length to the Stanislaus power house where connection will be made to Sierra and San Francisco Power Company's steel tower transmission line having a voltage of 104,000 for transmission to the bay districts.

THE PACIFIC SOUTHWEST

BENSON, ARIZ.—A large factory for the manufacture of dynamite is being erected by the Apache Powder Co. here.

RIVERSIDE, CAL.—The Santa Fe Railroad has included in its budget for 1921 an item of $200,000 for a new depot here.

QUESTA, N. M.—The Molybdenum Corporation of America contemplates the construction of a hydroelectric plant on the Red River near here.

LOS ANGELES, CAL.—New Hotel Broadway, 201 North Broadway, proposes an addition to cost $150,000. The McCarthy Company are owners.

ATASCADERO, CAL.—The board of trustees of the Margarita Black union high school here are receiving bids on a $200,000 school building which will include electric wiring, fixtures and heating equipment.

BAKERSFIELD, CAL.—The board of supervisors of Kern county announces the formation of the Mojave lighting district. F. E. Smith of Bakersfield is clerk.

LOS ANGELES, CAL.—The Union Brass Co. has announced the expenditure of $50,000 for new facilities at the corner of Santa Fe Avenue and Fifty-second street.

LOS ANGELES, CAL.—Little and Robertson have purchased a site at the corner of Enterprise Street and Santa Fe Avenue, to be used for a fabricated steel yard.

PHOENIX, ARIZ.—The South Side Gas and Electric Company has been granted a rate increase of one to three cents per kilowatt-hour, depending upon the amount of electricity used for domestic purposes.

SAN DIEGO, CAL.—Lange and Bergstrom, San Diego and San Francisco, have just been awarded contracts totaling nearly $500,000 in connection with the marine base here, consisting principally of concrete warehouses.

SAN BERNARDINO, CAL.—C. F. Winkle, Los Angeles consulting engineer, has been retained to make a report and prepare plans for water and power development in Cajon Basin. The plans include the development of 1000 hp. at Mathew's Lake project, to cost about $753,000, and the development of 770 hp. at the Vincent Cienega project to cost about $767,000.

SAN BERNARDINO, CAL.—The Southern Sierras Power Company is planning to make considerable expenditure in order to increase the power supply to the Coachella and Imperial valleys. Four transformers are to be installed, two of which will have a capacity of 4,000 kw., single-phase, while the other two will carry 4,000 kw., three-phase. These will step the current from 87,000 to 55,000 volts from the high voltage lines which come from Inyo county to the lines of the Imperial country. The company is also planning to install a substation at the Hanford Iron Works for the electric steel furnaces which are being built there.

SAN DIEGO, CAL.—San Diego Electric Railway Company was authorized on December 21 by the Railroad Commission to sell its power house and plant to the San Diego Consolidated Gas & Electric Company. United Light, Fuel & Power Company was authorized by the Commission to sell its steam heating system, also to the San Diego Consolidated Gas & Electric Company. The order approving the sale of the power and heating plants also contains authority to the gas company to issue $604,000 7 per cent cumulative preferred stock and $500,000 of first mortgage 5 per cent gold bonds in payment for the plant.

PASADENA, CAL.—By a vote of three to two the city commission has decided to return to the old electrical ordinance requirement of conduits for all electrical wiring. It is but a short time since the commission amended the ordinance so that electric wiring might be done in conformity with the requirements of the National Underwriters' Association. Now a change of front has taken place and the city returns to its requirement, which is somewhat stricter than that of the underwriters. The idea of permitting knob and tube wiring in small houses was advanced to aid those building small homes by reducing the cost of the electrical work. Pasadena was one of the pioneer cities requiring wiring in metal conduits and for years had fought to maintain that standard in the face of some opposition from those objecting to the cost of the conduit work.

SANTA FE, NEW MEX.—The Molybdenum Corporation of America contemplates building a hydroelectric power plant at Columbine and Red rivers, near Questa, for the generation of power for mining operations. Headquarters will be established at Questa. Water will be conducted to the plant by flumes.

THE INTER-MOUNTAIN DISTRICT

HAILEY, IDAHO.—The Mascot Mining and Milling Company contemplates the installation of a 700-hp. hydroelectric unit this spring. C. Peters is president of the company.

AMMON, IDAHO.—The Utah Power & Light Company has been granted a fifty-year franchise covering the right to maintain and operate electric light and power lines in the village of Ammon.

OGDEN, UTAH.—In the near future, probably within a month, wireless telephone communication between the United States Forest Service buildings in Ogden and Salt Lake City will be established.

SALT LAKE CITY, UTAH.—The committee on irrigation of the Utah Irrigation and Drainage Congress is considering legislation which it proposes to advocate at the next session of the Utah legislature.

EUREKA, UTAH.—A new electric hoist is being installed at the property of the Lehi-Tintic Mining Company. With this new hoist in operation a depth of 1200 feet can be reached, if necessary, in sinking the shaft.

EUREKA, UTAH.—A larger motor has been installed at the property of the North Beck Mining Company, and new machinery is now in running order. It is expected that extensive work will now be carried on at this property.

PARK CITY, UTAH.—The Ontario Mining Company has completed the installation of a 100-horsepower pumping unit, and has also installed three 100-kva. transformers to handle their entire operations with the exception of the compressor.

LOGAN, UTAH.—After considerable delay because of shortage of material, the new Whiteway street lighting system in Logan's business district was placed in operation on the night of November 27. This new lighting system consists of 172 600-cp. Novalux units.

DENVER, COLO.—A new city ordinance has been proposed which embodies regulations for installing an electrical bureau of the Denver Civic and Commercial Association and the Electrical Contractors' Association. The ordinance has been approved by the two organizations.

RUPERT, IDAHO.—The city of Rupert has entered into a contract with the Oregon Short Line Railroad to furnish electric power for pumping and lighting service. It is stipulated that the railroad company may have the right to ask for more power if required in the near future.

COLORADO SPRINGS, COLO.—A big project which will furnish electricity for five eastern Colorado towns adjacent to Colorado Springs has been set going by a new corporation known as the Farmers' Electric Light, Power and Coal Company. The company is incorporated for $100,000.

SALT LAKE CITY, UTAH.—According to news which has been received from Washington, D. C., it is probable that Salt Lake City will be the western center under the water power act, and that from headquarters here the development of the remaining water power in the intermountain country will be directed.

AMERICAN FORK CITY, UTAH.—The installation of a new electric lighting system is being considered here. The city is now maintaining its own lighting system at a cost of $200 per month. Under the new arrangement the Utah Power & Light Company would run and maintain the lighting at a slightly larger cost.

SALT LAKE CITY, UTAH.—The hearing on the protest of the town of Milford against the rates of the Telluride Power Company has been held before the Public Utilities Commission of Utah, and the Commission has given a decision against the protest. On January 1, 1920, the Telluride company raised its rate, which was the cause of the protest.

PARK CITY, UTAH.—The New Quincy Mining Company, which has leased the Little Bell Mining Company's shaft, buildings and machinery, in addition to spending a considerable sum in new machinery and equipment, has completed arrangements for electric power to carry on its operations, and has outlined a program of extensive work to be commenced immediately.

EUREKA, MONT.—Arrangements have been made for the immediate construction of a power line to furnish electric service for the operation of the Eureka Standard mine. About 400 feet of the new power line will be needed to connect the Eureka Standard workings with the line which some time ago was built between the Tintic Standard and the South Standard mines.

LOVELAND, COLO.—The city of Loveland will not be required to obtain a special order from the state public utilities commission before it may proceed in court to acquire by condemnation the distribution system of the Western Light and Power Company in the city of Loveland, according to a finding made by the commission upon a petition recently filed by the city.

SALT LAKE CITY, UTAH.—Steps have been taken by the farmers of Davis county to form the Davis County Irrigation District. In the boundaries of this district there are about 65,000 acres of land. The proposed district runs from Centerville to the county line on the north, and part of the lands are covered by the Davis and Weber counties canal. It is expected that considerable electric power will be used for pumping.

SALT LAKE CITY, UTAH.—Negotiations looking to the extension of the lines of the Utah Power & Light Company to Oakley, Wanship, Kamas and Woodland, in Summit county, are in progress, looking to settlement of a difference of opinion, in which the public utilities commission of Utah, in an informal way, is virtually asked to assume the role of arbitrator. The question at issue is the price that should be paid, if any, to the Weber Creamery & Milling Company, which is supplying electric energy to twenty-six consumers at Oakley.

BOISE, IDA.—C. L. Cory, an electrical engineer of San Francisco, Cal., has arrived in Boise to make a survey of the electrical situation here and to collect data concerning the use of power, rates, valuations and other necessary information. He was brought to Boise by the city council, which authorized several weeks ago the employment of such an engineer to look into the electrical needs of the city. The material gathered will probably be presented to the Public Utilities Commission when the subject of electrical rates comes up, it is said.

SALT LAKE CITY, UTAH.—The Federal Power Commission has received an application from the Great Basin Power Company, of Salt Lake City, for permission to build an earthen dam 110 feet high, a reservoir, two small diversion dams, and conduits and a power house on the north fork of the Duchesne river. For the purpose of supplying hydroelectric power to manufacturers and railroads operating over a large section of Utah, the Great Basin Power Company of Salt Lake City is preparing to expend approximately $1,500,000 for the erection of a plant in the Uintah basin.

SALT LAKE CITY, UTAH.—In line with the policy comparatively recently adopted by the Westinghouse Electric & Manufacturing Company for the education of the electrical dealer on the subject of better merchandising methods, that company put on the "Better Merchandising Show" at the Hotel Utah on December 8 and 9. To this show, which was in reality a physical demonstration of certain features that go to make for better merchandising, all dealers in Salt Lake City and the immediate vicinity were invited. Such matters as stocks, service, stock arrangement, window trimming, proper accounting systems, etc., were all explained and demonstrated through a series of charts, actual window trims, etc., in such a way as to bring out the point to the dealer in a logical and forceful manner.

A native son, with the real California spirit, was presumably responsible for a recent newspaper item which stated that a certain installation had an 85-hp. water-wheel driving a 7,000-kva. generator. After all, everything grows large in California; why not horsepowers?

The futility of life is a favorite subject with the poets, and here is one more wail from the weary pessimist. This may not sound like poetry, but as each line begins with a capital letter it is probably free verse.

Eating is waste of food.
Sleeping is waste of time.
Washing is waste of soap.
Cooking is waste of gas.
Dancing is waste of shoes.
Motoring is waste of tires.
Writing is waste of paper.
Reading is waste of eyesight.
Buying is waste of money.
Selling is waste of samples.

* * *

A newly invented device for "wind distributing from electric fans" is announced from Japan. When one of these is installed and the fan set in motion, you will find it impossible to get out of the draught, no matter where you sit.

* * *

Falling prices are if anything slightly more irritating than rising prices to some people because they don't fall fast enough. Here, however, is balm for some of the irritated souls:

"A fallacy printed and no doubt frequently believed in these days of declining prices is that if an article has increased in price 100 per cent over pre-war or for instance, 1918, prices, it should decrease a similar per cent. The statement has been made in the press that lumber has increased 100 per cent since the close of the war, but has only decreased 50 per cent, leaving the inference that it should decrease another 50 per cent to be at normal levels. If $50 lumber increased in price 100 per cent it would sell for $100. When it decreases 50 per cent it is back at the original price of $50."

* * *

Violet rays have been simplified by an inspired London barber, judging from a report of a recent prosecution in that city.

A young man entered a barber's shop for a shave, and the barber persuaded his client that treatment of the skin by "violet rays" was what he really required. The young man consented, and the barber charged him $25 for rubbing a violet electric lamp over his face.

An encouraging title which promised a solution of our haberdashery problems reads, "How We Can Obtain Greater Life Out of Our Ties." We read the first sentence excitedly: "There is absolutely no reason why the life of the average tie could not easily be extended from 12 to 20 years or more" — and then we awoke with a start to find we were reading an item on railroad economies.

* * *

Financial pressure has compelled increased rates on street railways, but the five o'clock pressure, atmospheric and otherwise, seems still to trouble the commuting public.

Said the conductor, thoroughly examining the lady passenger's transfer: "This here transfer expired an hour ago, lady."

"I don't wonder," replied the lady coldly. "There wasn't a single ventilator open in the whole car."

* * *

Another of those advertisements reads:

"WANTED—Chemist who is thoroughly conversant with the manufacture of alcohol from blackstrap, and who has a thorough knowledge of making non-alcoholic cordials and all kinds of flavoring extracts, such as are commonly used at soda fountains."

No, we do not know where that soda fountain is.

* * *

We have added to our rapidly growing collection of the "foolish question" series the story of the well-known lecturer who, when about to deliver a lecture in a small Missouri town, asked the chairman of the committee if he might have a small pitcher of ice water on the platform table.

"To drink?" inquired the committeeman.

"No," answered the speaker, "I do a high diving act."

* * *

THE ELECTRIC LAMPHIBIAN

(To the tune of "Tit-Willow")

A lamphibian sat on a fixture and cried,
"Oh bill-o, low bill-o, low bill-o."
He had a tough filament in his inside,
Sing "Bill-o, low bill-o, low bill-o."
He said his resistance was one of the best,
His diet was light, and he never had guessed
Why that filament took him so long to digest,
Singing "Bill-o, low bill-o, low bill-o."